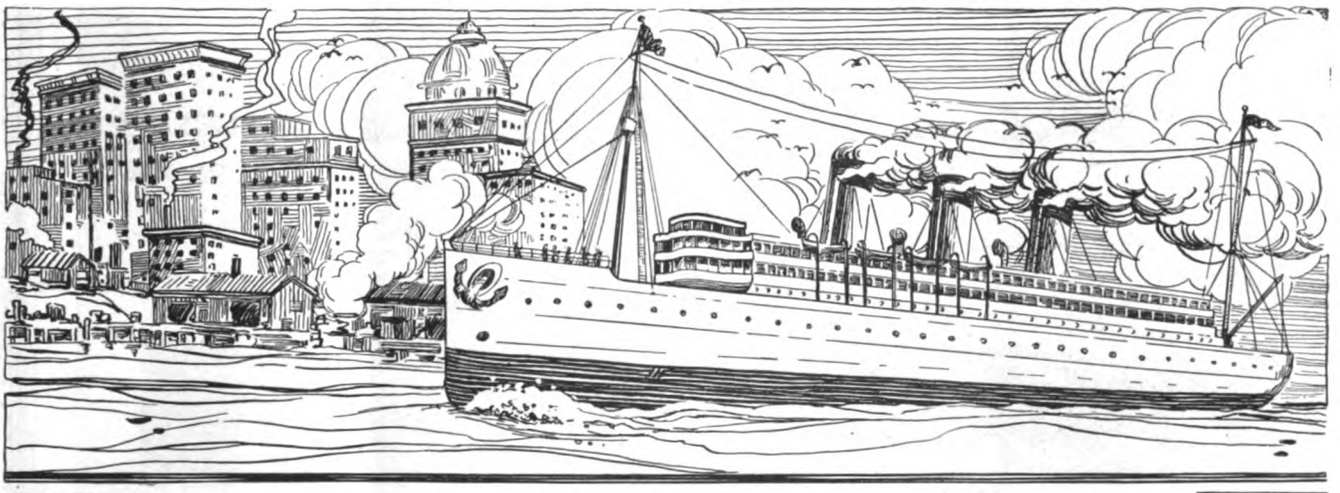

CLEVELAND—NEW YORK, AUGUST, 1916

THE MARINE REVIEW

A Monthly Publication Devoted to Ship Building, Marine Engineering and the Business of Transportation by Water.

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THE MARINE REVIEW

VOL. 46 CLEVELAND AUGUST, 1916 NEW YORK No. 8

How Ship Yards Boost Trade Abroad

Foreign Owned Vessels Now Being Built in This Country Will Have Cumulative Effect in Expanding Our Foreign Commerce

THE proprietor of the cross-roads store, with its motley assortment of garden seed, oils, calico and mail, owes what business success he has largely to his intimate acquaintance with the personal affairs of his bucolic clientele. A request for an extension of time on an account does not necessitate a conference with a representative of the Credit Men's Association, but instead simmers down to a talk with the customer over the condition of the corn in the north field.

In extenso, the village and small town merchant rarely is forced to rack a reluctant memory before recalling the name of the purchaser who has just entered the store. In the city of six or more digits, this intimate personal touch is lost, but is supplanted by that intangible asset called good will. The head of a successful firm may never know the names of 99 per cent of his customers, while these in turn may never grow to distinguish between the proprietor and the head floorwalker. Nevertheless, the store succeeds through the circle of satisfied patrons that it accumulates, a circle that grows partially from itself.

We are all familiar with the names of scores of firms whose activities are encompassed only by the nation's boundaries. By far the greater bulk of their customers have never seen a representative of the firm, nor the main office or plant. But through the momentum of a spreading circle of friends, these national firms have become household names as familiar as the little tobacco store on the corner where the street cars stop.

Afraid of the Water

When we reach the borders of these United States, this progressive advance in the scope of American business activities, halts abruptly—as if the sight of the blue expanses of ocean stretching toward foreign lands produced the same mental reactions felt by a Hottentot when confronted by a tub of ice-cold water.

Analytic ability of a high order is not required to reveal what is the cornerstone of success of the cross-roads store, the village emporium, the city establishment or the nationally known house. Their prosperity can be traced to a common origin—that is, the fact that they are known. Phrased in that manner, it seems platitudinous, but it cannot be too vigorously impressed on the minds of American merchants. A wide gap apparently severs the country dealer with his neighborly concern in baby's teething from the country-wide operator whose trade slogan is familiar to hundreds of thousands. The gap in reality is nonexistent, they both attract business because their reputation, their location and their goods are well known.

What relation or parallelism exists between their methods and those which the American, groping for foreign trade, must pursue?

How the Ship Yards Are Helping

For example, consider the results that the incursion of American ship builders into the foreign market will have. It is easy, of course, to believe that American ship yards having begun to turn out boats for foreign owners will continue to do so. The high quality of American products and workmanship are becoming familiar, now that mounting production costs in Europe have enabled these to be demonstrated. But the ship in reality is only a small part of the gain. The hundred and one items of equipment entering into the finished boat will bear American labels. A firm in St. Paul is now making deck winches for boats building for Norway. Possibly the Norse owners never heard of St. Paul. Certainly they never heard of this firm. The owners, if satisfied with the boat and its equipment, will merely follow the entirely human practice of talking about it. The circle of friends to whom they show the boat and its auxiliary apparatus, will repeat the tale and so the groundwork will be laid for an expanding trade in the American goods.

The vista is enchanting. Every foreign order filled by an American firm, particularly if it is the first one and is for purely commercial purposes, is as important as that difficult first sale for which the commercial traveler works so hard. The sale removes the American from the class of an English-speaking merchant in a purely foreign neighborhood. It gives him a friend in court.

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Fitting New Bow to Salvaged Stern

A New Forward Section is Being Built at Superior to be Joined to After End of Wrecked Steamer Moreland

THE Superior Ship Building Co., Superior, Wis., is at work upon a combined new construction and repair job of unusual character. The salvaged stern section of a lake freighter, wrecked and sunk nearly six years ago, is being repaired at the same time that a new forward end is being built. The two sections will be joined and the rebuilt 600-foot boat completed in time to enter the fall lake trade. The after end was raised from the wreck of the steamer W. C. MORELAND, five years ago and after fruitless efforts were made to sell it, was again sunk. The same conditions which operated to recall to salt water service many hulks that had apparently sailed for the last time, also gave renewed value this year to the stern of MORELAND as it rested on the bottom of Lake Huron. The assurance of an enormous freight movement in 1916, culminating in the fall when grain shipments begin their eastward journey, resulted in the stern being again raised. After being sold twice, it was placed in drydock at Superior under rush orders to rehabilitate the vessel and to commence the immediate construction of a new bow. MORELAND was launched originally on July 27, 1910, at the Lorain, O., yards of the American Ship Building Co. She was built on order of the Jones & Laughlin Steel Co., Pittsburgh, and was managed by W. H. Becker, Cleveland. Her original dimensions, which she will maintain in her reconstructed form, were 600 feet over all, 580 feet keel, 58 feet beam and 32 feet deep. Her carrying capacity was 12,000 tons.

The wreck which condemned her to almost six years of idleness, occurred on her maiden trip. Downbound with a cargo of 10,700 tons of iron ore, MORELAND stranded on the rocks at Eagle Harbor, Lake Superior, Oct. 18, 1910. The site of the accident is one of the most dangerous on the lakes, owing to its exposed position. Wreckers were immediately ordered to her, but heavy weather prevented work and she was abandoned by her owner as a constructive total loss on Nov. 2. At the time of the accident, she was the largest vessel ever lost on the lakes.

She was broken into three parts. Breaks in the hull occurred at hatches Nos. 12 and 24. Following repeated efforts, Captain James Reid, wrecker, raised the after portion of MORELAND in the fall of 1911. After being successfully bulkheaded, the stern section was towed to Detroit, in September, 1912. An excellent view of her appearance at that time is shown in Fig. 1. The salvaged section was 292 feet long.

Unsuccessful efforts were made to sell the recovered section. With steel selling at the comparatively low prices of 1912, it was cheaper to build a new boat. The wreck, therefore was sunk in shallow water where she rested until this spring.

The great increase in steel prices, with consequently higher costs for new ships, coupled with the enormous demand for tonnage to move the record-breaking 1916 freight movement united to enhance the value of the salvaged section of MORELAND this year. Roy M. Wolvin, Duluth, purchased her and she was raised and placed in drydock at Detroit. The American Ship Building Co. was the successful bidder for the work of rebuilding the vessel and a few weeks ago she was towed through Lakes Huron and Superior, past the scene of her wreck, to the yards of the American company's subsidiary, the Superior Ship Building Co., Superior,

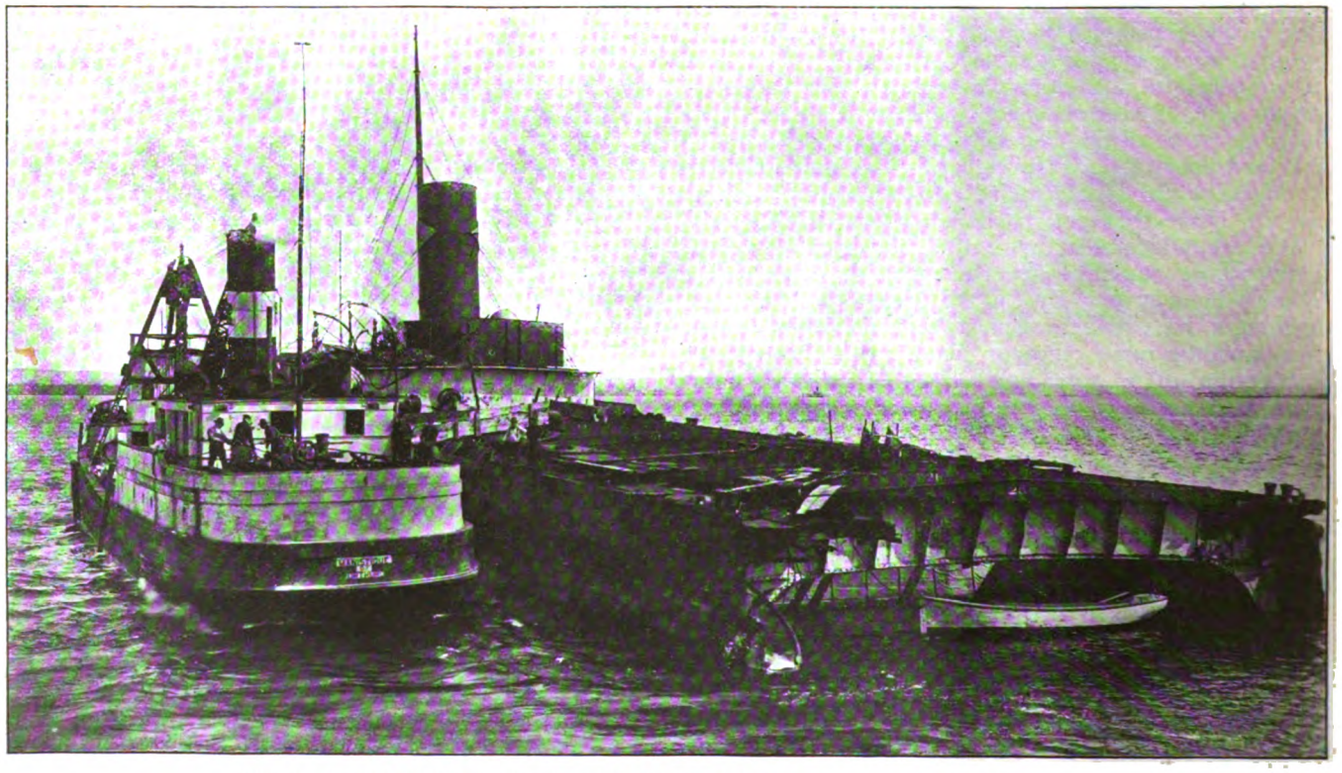

FIG. 1—STERN SECTION OF STEAMER MORELAND ENROUTE TO DETROIT IN 1912

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Wis. Mr. Wolvin has sold her to the Canada Steamship Lines and when completed she will ply the lakes under Canadian register. Construction work on the new bow was begun in February and this section will be launched about Aug. 1. In the meantime, work is being steadily pushed on the after end. Both sections will be ready to be placed in drydock early in August when the work of joining them will be started. Every effort is being made to complete the work in time to permit the vessel to participate in the heavy fall freight movement, and it is expected that she will leave Superior on her initial trip late in September.

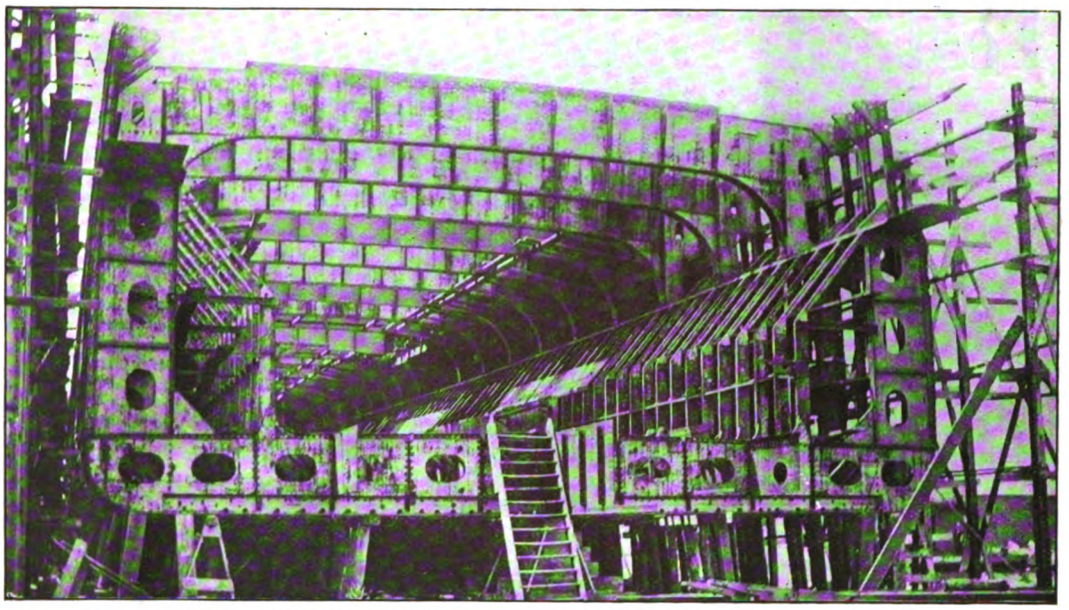

FIG. 3—FORWARD END UNDER CONSTRUCTION AT SUPERIOR

The work of rebuilding the after end and of building the new forward portion is under the supervision of L. Williams, superintendent of the Superior Ship Building Co. The refitting of the stern presented some unusual problems in ship yard work, all of which, however, are being successfully met. The entire bottom of the after end from frame 125 to the engine room, a distance of about 165 feet, including the whole inner bottom construction as well as the hopper sides, will be cut out completely. One arch beam or division between hatches has to be cut out and replaced.

All electrical equipment will have to be replaced. The after deck house is being almost completely rebuilt and all woodwork in connection with the cabins must be renewed. While about two-thirds of the ballast piping in the after section will be utilized, it has been necessary to remove practically all of it in order to permit reconstruction work on the hull. Most of the plumbing and steam pipes will be renewed. The steering engine will be overhauled and the steering chains and cables renewed.

The boilers and engines were found to be in fairly good condition but a great amount of overhauling is necessary. This work is progressing simultaneously with the reconstruction of the hull, and is in charge of Chief Engineer Grant, who will sail on the vessel.

MORELAND is of the distinctive type of bulk freighter peculiar to the Great Lakes and owing to her large carrying capacity is expected to prove a lucrative investment for her owner. She is adapted for carrying bulk cargoes such as iron ore, coal and grain. She will probably run in the grain trade during the closing weeks of this season.

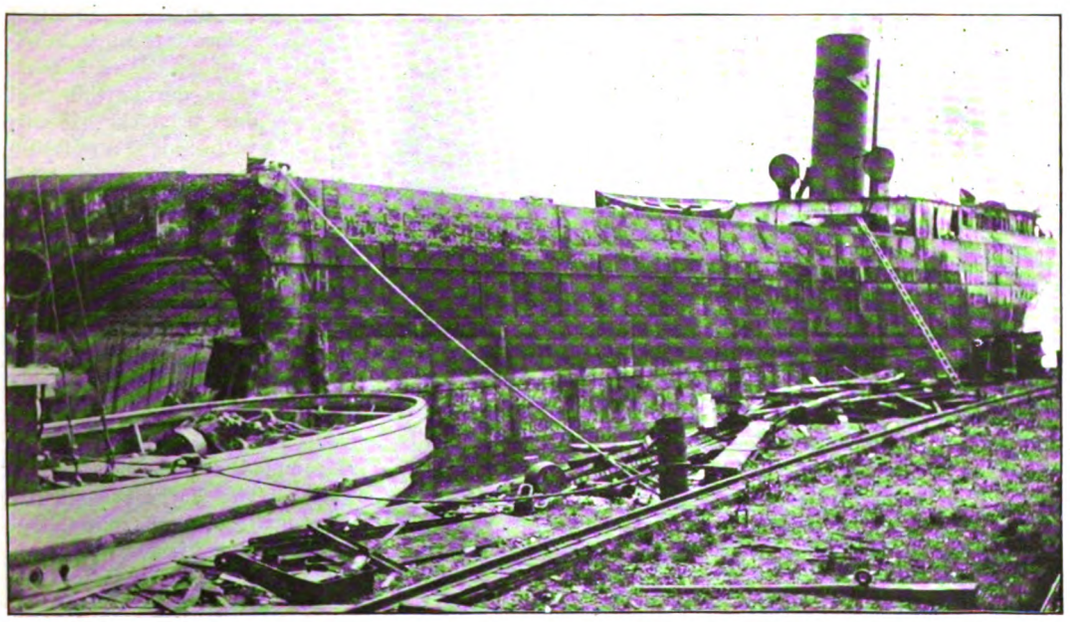

FIG. 2—STERN SECTION OF MORELAND ON ARRIVAL AT SUPERIOR IN 1916

Power Boats Would Help

Tragedy has the power to teach lessons which men do not learn under normal conditions. The fatal wreck of the steamer BEAR, on the Pacific coast has shown shipping men the necessity of equipping sea-going ships with power lifeboats in addition to the life rafts and rowboats carried. So strong has been the impression made by the disaster at Blunt's Reef, that already shipping companies are placing power boats on their passenger carriers. If BEAR had been so equipped, probably no life would have been lost. The ship struck near the shore and the lifeboats were carried in by the sweep of the tide toward the surf and rocks. The lives lost were sacrificed when the boats overturned on shore. If a strong power boat had been included in BEAR'S equipment, it probably could have towed the rowboats and life rafts to the lightship against the pull of the tide and all lives would have been saved. Or in other marine disasters, if there had been power boats to serve as tugs, more lives would probably have been saved.

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Test of Boiler Vindicates Design

This Article Outlines the Method and Equipment Used in Making an Exhaustive Test on a Ward Boiler—The Results Verify Theoretical Principles

By Lieutenant S. M. Robinson, U. S. N.

A WARD boiler was rigidly tested at the plant of the Charles Ward Engineering Works, Charleston, W. Va., by a board consisting of Lieutenant Commander H. C. Dinger, U. S. N.; Lieutenant S. M. Robinson, U. S. N.; Lieutenant A. M. Penn, U. S. N., and A. Conti. The boiler tested was the Ward straight tube type, having a total tube heating surface of 4,405 square feet, the volume of the furnace being 476 cubic feet. The fuel used was Elk Refining Co., paraffine base. The seven burners were type I of the bureau of steam engineering.

The apparatus and arrangement for test are shown in Fig. 1. The boiler was fitted with a wooden air box at front, fitted with an air lock. Air was supplied by a motor-driven Sturtevant blower. As the blower motor was of the constant-speed type, the air supply was regulated by a butterfly shutter in the blower discharge and a sliding door on the front of the air box. Feed water was supplied by two horizontal Blake plunger pumps, discharging through two Reilly feed-water heaters, the boiler being fed through two check valves. The temperature of the feed water was taken at the feed valves. Oil was supplied by two Blake horizontal, piston, simplex oil pumps, discharging through a Reilly oil-fuel, coal-type heater to the fuel-oil main at the boiler front, a special air chamber being fitted on the discharge line. There were fitted, in addition, three large air chambers near the oil heater. These additional air chambers were found necessary in order to reduce fluctuations in pressure. Temperature of the oil was taken at the boiler front. The oil used was Elk Refining Co.'s paraffine-base West Virginia oil, of the following characteristics: Special gravity at 60 degrees, 0.8245; baume, degrees Fahr., 40.1; flash point, degrees Fahr., 144.0; fire point, degrees Fahr., 270.0; viscosity (Engler) at 60 degrees Fahr., 9.25; acidity, none; B. T. U., 19,879; sulphur, none. The feed water was measured by taking account of the number of tanks, from a tank calibrated by actual water measurement and found to hold 4,875 pounds. The tank measurement was taken at the beginning and end of the test, and correction applied. Correction was also applied for the difference in boiler-water level at the beginning and at end of the test. The oil was measured by weighing the actual oil every 10-minute interval. After having weighed the tank, oil was run into a pump-suction tank. The height of oil was brought up to a mark at the end of each 10 minutes. Steam generated was blown into atmosphere, except that used for pumps and feed-water heaters.

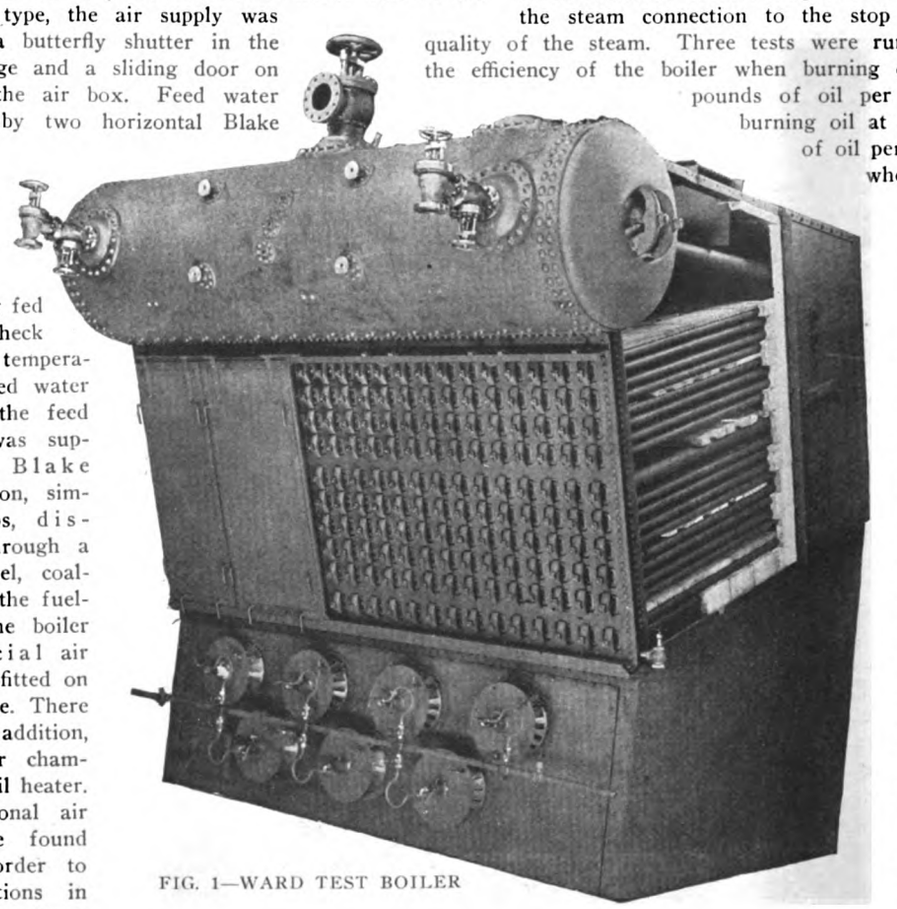

FIG. 1—WARD TEST BOILER

A Hayes carbon dioxide (CO_2) apparatus was connected to the base of the stack. Samples of gas were taken every half hour. The results of the gas analysis are believed to be unreliable, as they show very little excess of air used over that theoretically possible; as there was smokeless combustion at all times, this would be impossible. An electric pyrometer was fitted in the base of the stack. This was checked during trials with a mercurial pyrometer and found to be accurate. A throttling calorimeter was fitted just below the steam connection to the stop valve to determine the quality of the steam. Three tests were run, the first to determine the efficiency of the boiler when burning oil at the rate of 2,300 pounds of oil per hour, the second when burning oil at the rate of 1,500 pounds of oil per hour, and the third test when burning oil at the rate of 3,100 pounds of oil per hour. Details of the tests are as follows:—

Test No. 1

Approximate rate, 2,300 pounds of oil per hour. Test begun 5 p. m., Feb. 7, 1916; ended, 11 p. m., Feb. 7, 1916. Seven burners fitted with 5/64-inch tips and 3/64-inch plugs were used. Two oil pumps, two feed-water pumps and two feed-water heaters were in operation throughout the test. There was some vibration on several occasions during the trial, due to lack of care with air regulation. No smoke was observed during the entire trial. A small excess of air was supplied. At 8 p. m. one feed pump broke down and operated indifferently during the remainder of run. The casing of the boiler, especially the left side in wake of lower rows of tubes at back, became red hot in places, indicating insufficient lagging behind the brick

Test No. 2

Approximately 1,500 pounds of oil per hour. Test began midnight, Feb. 7, 1916; ended at 6 a. m., Feb. 8, 1916. Seven burners were used. The burners used had 1/16-inch tips and 3/64-inch plugs. One oil pump, one feed-water pump and one feed-water heater were in operation. The conditions were very steady during the entire trial. The combustion was excellent. The casing became quite hot at sides near back of boiler. No smoke was observed during the entire run.

Paper presented before the American Society of Naval Engineers.

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At the close of the test, the boiler was let down. The brickwork appeared to be in a very good condition; the bottom appeared to be somewhat uneven, indicating that the magnesia under the bricks was disintegrating to some extent.

During Feb. 8, the feed pump was overhauled. Additional asbestos millboard was placed behind the metal side casing, and the brickwork, especially that on the left side of the boiler, was repaired.

Test No. 3

Approximate rate, 3,100 pounds of oil per hour. Fires were started at 12:30 p. m., Feb. 9, 1916. Data for the test were taken from 1:30 p. m. Test ended at 6:30 p. m. On account of insufficient time to get the boiler warmed up to proper condition, it was decided to use data for four hours, from 2:30 p. m. to 6:30 p. m. Seven burners were used. The burners used had 3/32-inch tips and 3/64-inch plugs. Two oil pumps, two feed pumps and both feed heaters were used. Owing to the lightness of the oil, difficulty in forcing a sufficient amount through the burners was experienced when the oil was heated. The oil was therefore not heated after the first hour. With cold oil the required amount of oil was burned. There was no observable smoke during the entire run. The left side of the casing became red-hot during the test, indicating that there is insufficient insulation in the casing as the boiler is usually built.

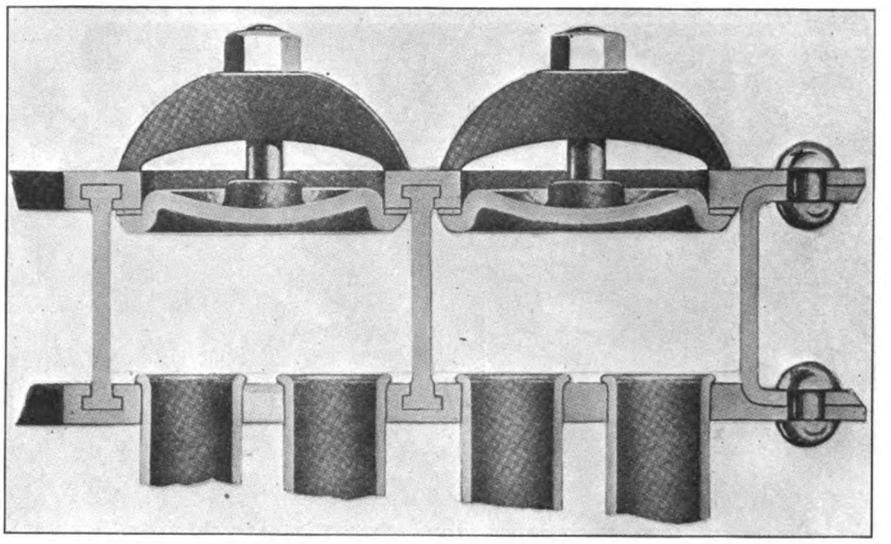

FIG. 4—SECTION THROUGH WROUGHT STEEL BOILER HEADER SHOWING METHOD OF STAYING TUBE AND HANDHOLE SHEETS

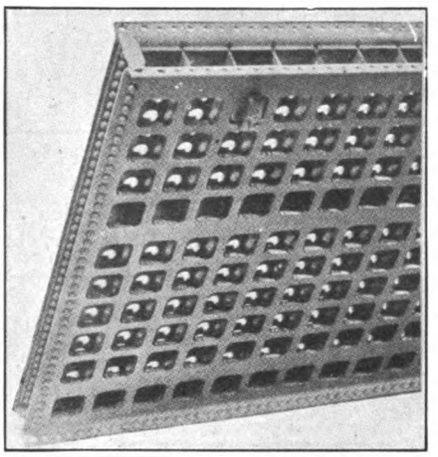

FIG. 3—PORTION OF FRONT

The boiler steamed freely under all the tests. The circulation is evidently satisfactory. Small propellers were placed in two of the intermediate 4-inch tubes, with a rod running through the hand-hole. The movements of these rods indicates a down-flow in the 4-inch tube at all rates of steaming.

Character of Circulation

After the regular test the Charles Ward Engineering Works, at the suggestion of the board, installed propellers in several of the 2-inch tubes, as shown in Fig. 2, to ascertain the character of the circulation. No. 2 began to revolve about five minutes after the fires were started; the direction of rotation showed down-flow in these tubes. No. 1 hesitated slightly, showing some inclination to turn left-handed, which was probably due to suction caused by the down-flowing water from No. 2. This condition changed before steam was raised, and No. 1 began to revolve in the opposite direction, showing that the water was flowing up the lower bank of 2-inch tubes. Nos. 3 and 4 began to revolve left-handed in about 10 minutes after the fires were lighted, the speed increasing until they were running like windmills, so fast that the revolutions could not be counted; the direction of rotation showed down-flow in these tubes. No. 4 remained stationary until there was abou 50 pounds of steam on the boiler, and then it commenced to revolve in a left-handed direction, indicating that as soon as the water level raised on the high side of the tubes, due to the steam-making condition, there was a down-flow through the 2-inch tube mentioned. From these experiments it may be in-

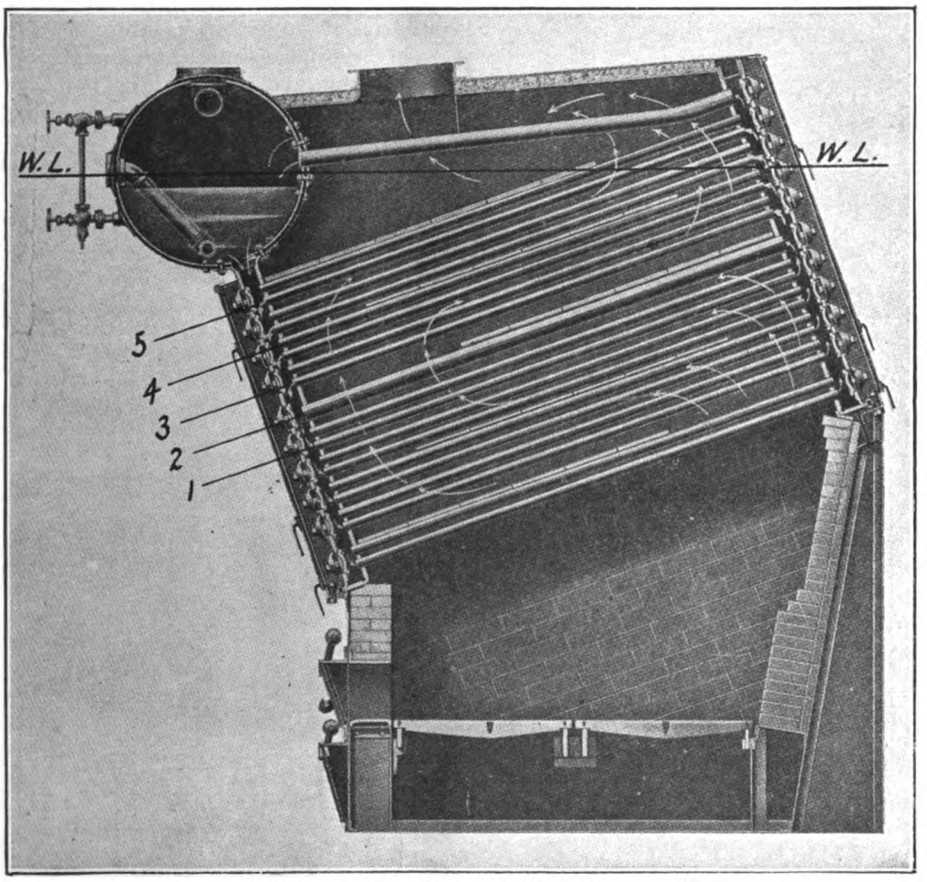

FIG. 2—SECTIONAL VIEW OF BOILER

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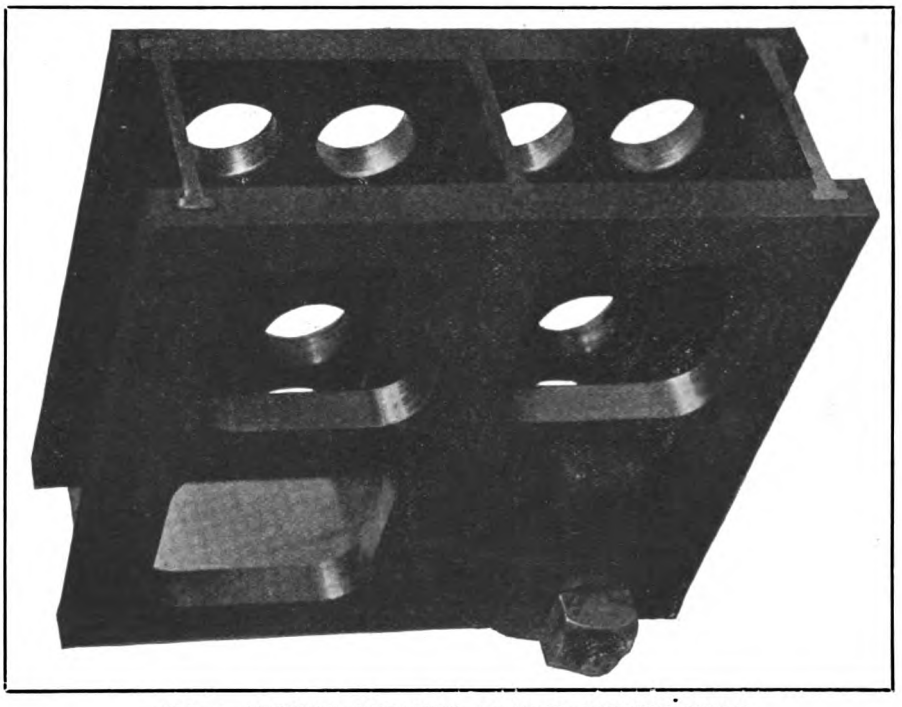

FIG. 5—SECTION SHOWING HEADER CONSTRUCTION

ferred that the flow is upward through all the 2-inch tubes below the middle baffle, and downward through all the 2-inch tubes in the upper portion of the boiler, the velocity being quite rapid, for, as stated, the propellers were revolving in the neighborhood of 200 revolutions per minute or more. The high velocity of the propellers in the small tubes is due to the fact that the shafts were of very small diameter and consequently there was very little friction.

To establish the volume of water flowing down through the 4-inch tube, one of the propellers was removed and installed in a short piece of pipe, this being connected to the city water main and the propeller operated under a pressure of about 40 pounds, the discharge being throttled until the propeller made approximately the same number of revolutions as it did in the boiler. Readings from the water meter over a period of five minutes showed that there was about 50 gallons per minute passing through this tube. This, however, is only an indication of the amount of water flowing through the 4-inch tubes, as the friction on the propeller was very much greater under the higher pressure conditions existing in the boiler.

The foregoing results are very interesting, and are believed to throw a new light upon the problem of circulation in boilers of this general type of construction. They also indicate that the baffling as arranged secures the benefit of the counter-current principle within the boiler. The casing as it is constructed is insufficiently insulated for high rates of combustion. This can, however, be easily remedied by providing additional insulation, and, if brickwork is provided with anchor bolts, injury due to panting will be avoided.

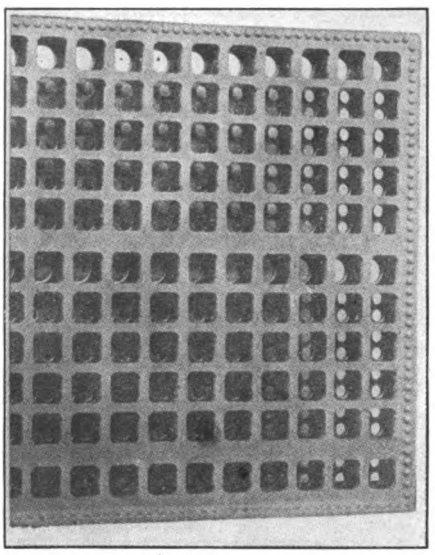

FIG. 6—PORTION OF BACK FLITCH OR HEADER

No distortion of any of the lower tubes was observed, and it is apparent that there is no difficulty in giving the lower tubes an ample supply of water.

Comments on Design

The design gives a very compact straight-tube boiler with good circulation. The baffling as arranged gives a counter-flow action between water and gases through the boiler, which apparently secures very high efficiency. The manner of staying the water chambers is considered efficient, and no trouble should be expected from the design of the water chambers. There is ample space in the header beneath the edges of the lower tubes to allow for the collection of sediment, should this be contained in the feed water.

Lloyd's Register of American Yachts, 1916 edition, 496 9 x 7-inch pages; blue cloth, gilt edges; published by Lloyd's *Register of Shipping,* and furnished by *The Marine Review* for $7.50 net.

The Register of American Yachts for the current year is of unusual interest due to the disappearance of old yachts and the addition of new ones which is indicative of a radical change in the American pleasure fleet. The war is somewhat responsible for the changes among the largest of the steam yachts. Several of the most famous of American pleasure yachts have been placed in commercial service within the last year or two. A study of the section of the book devoted to diesel engines shows a tendency toward larger vessels with increased power and speed. One of the most prominent features of the year's building is the predominance of the naval type. The 1916 register contains the names of 3,589 yachts with the names and addresses of their owners, details in regard to yacht clubs in United States and Canada and the private signals of over 1,800 yachtsmen.

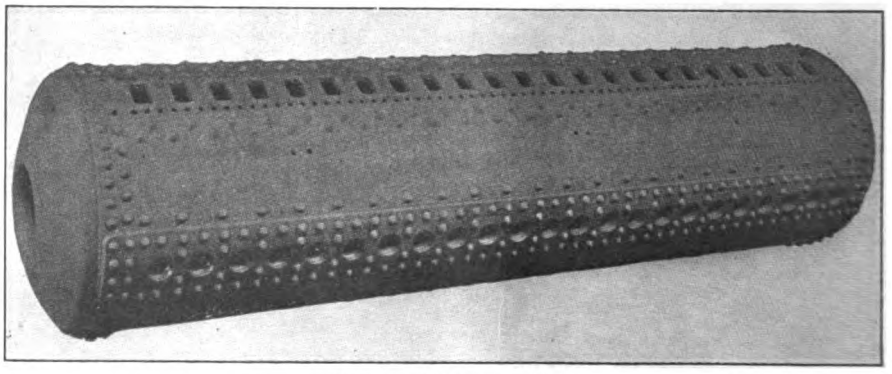

FIG. 7—STEAM DRUM

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Japanese Tramp Steamers

The number and tonnage of Japanese tramp steamers has been strikingly extended since the outbreak of the war. A statement from the director of the shipping affairs bureau in the ministry of communications credits Japan with 272 tramp steamers, displacing more than 1,000 tons, their combined tonnage amounting to 715,012 tons. Of the number, 112, with a total of 249,258 tons, are run by the owners themselves, while 160, with a total of 465,754 tons, are chartered.

Of the whole number, 188 ships, with a total tonnage of 423,031, are run in the coastwise trade, while 84 bigger ships carry on the ocean trade, these being distributed as follows: European routes, 14, tonnage 57,515; North American routes, 34, tonnage 129,835; Australian routes, 4, tonnage 11,790; Indian routes, 17, tonnage 56,560, and South Seas, 12, tonnage 36,281.

The Nippon Yusen, Osaka Shosen and the Toyo Kisen Kaisha applied to the department of communications for permission to raise outward freights on the Antwerp line of the European service and outward and homeward freights on the Puget Sound and San Francisco lines of the American service, which are run under government protection. The government has granted the applications, with some modifications in the original scales of increase applied for. Freights for North American ports have been raised by about 20 per cent. The principal goods involved are rice, tea, matting, raw silk, silk textiles, cotton manufactures, soy, bamboo and bamboo ware, porcelain and pottery, straw braid, foodstuffs, grain, peanuts and camphor.

Homeward freights have been raised by about 25 per cent, with a few exceptions. The principal goods affected are raw cotton, machinery, iron and steel plate, iron wire, salt fish, pulp, wheat, flour, tinplate, malt, nails, resin, condensed milk and glass. All these advances are to come into operation immediately.

Nationalities of Certificated Seamen

Returns received by the United States steamboat inspection service up to June 1, show that the service has issued United States certificates as able seamen to 20,678 men, distributed according to nationality as follows:

Americans (native)	6,302	Spaniards	306
Norwegians	2,718	South and Central America and Mexico	195
Americans (naturalized)	2,165	Greeks	179
Russians and Finns	1,706	Asiatics	137
Swedes	1,480	French	63
British	1,451	Swiss	39
Germans	1,309	Belgians	31
Danes	721	Turks	22
Dutch	640	Roumanians	10
Portuguese	476	Serbs	3
Austrians	386	Montenegrins	3
Italians	332	Bulgarians	3
		Luxemburger	1

The native Americans include also native Hawaiians and Porto Ricans.

Certificated able seamen are required in the deck department on American vessels of 100 gross tons or over except those navigating rivers exclusively or the smaller inland lakes and except on fishing or whaling vessels or yachts.

Soo Canal Commerce

The statistical report of the lake commerce through the canals at Sault Ste. Marie for the month of June shows that of a total freight movement of 12,960,469 tons, 9,785,490 tons passed through the Michigan canal. More than two thirds of the iron ore passed through the American canal. The increase in iron ore tonnage over May is more than 1,500,000 tons. This is the heaviest traffic for one month on record. A summary of the total tonnage through both canals up to July 1 is as follows:

EAST BOUND

	To July 1, 1915	To July 1, 1916
Copper, net tons	43,272	30,807
Grain, bushels	14,389,509	29,714,152
Building stone, net tons		
Flour, barrels	2,302,247	1,953,556
Iron ore, net tons	11,072,607	18,474,348
Pig iron, net tons		14,215
Lumber, M. ft. B. M.	137,745	85,898
Wheat, bushels	34,688,112	84,123,491
Unclassified freight, net tons	94,250	55,499
Passengers, number	4,671	5,876

WEST BOUND

Coal, anthracite, net tons	678,852	616,558
Coal, bituminous, net tons	3,022,437	4,372,197
Flour, barrels	100	205
Grain, bushels	31,250	1,010
Manufactured iron, net tons	75,205	56,370
Iron ore, net tons		5,631
Salt, barrels	232,173	288,090
Unclassified freight, net tons	326,269	396,886
Passengers, number	4,346	4,753

SUMMARY OF TOTAL MOVEMENT

East bound, net tons	13,006,133	21,978,577
West bound, net tons	4,138,001	5,490,730
	17,144,134	27,469,307
Vessel passages	5,576	7,597
Registered tonnage, net.	13,811,292	21,525,367

Results of Tests on a Ward Boiler

SYNOPSIS OF TESTS.

Test No.	2	1	3
Approx. rate of oil burner per hr. required by schedule 7,360	1,500.00	2,300.00	3,100.00
Oil actually burned, lbs. per hour	1,509.70	2,440.70	3,082.00
Pounds of water evaporated from and at 212 deg. Fahr. with oil as fired of 19.879 B. T. U.	16.73	16.48	16.21
Reduced to 19,000 B. T. U.	15.99	15.75	15.49
Guar. for 19,000 B. T. U.	15.66	15.33	15.00
More than guaranteed	0.33	0.42	0.49

TABULATED RESULTS OF TESTS.

Test No.	2	1	3
Barometer	30.79	30.73	30.55
Lgth. of test averaged, hrs.	5.00	6.00	4.00
No. of burners used	7.00	7.00	7.00
Bore of burner tips, in.	1/8	5/64	3/32
Steam Observations.			
Steam pressure, lbs. gage	194.75	196.00	197.60
Calorimeter shell pressure, ins. of Hg	2.82	2.80	2.60
Calorimeter shell temperature, deg. Fahr.	305.30	305.70	304.60
Feed temp. of boiler, deg. F.	183.60	113.00	168.30
Water actually evaporated, lbs. per hour	23,532.00	35,082.00	45,878.00
Oil Observations.			
Oil burned, lbs. per hr.	1,509.70	2,440.70	3,082.00
Oil pressure at burners, lbs. gage	258.00	255.00	283.00
Oil temp. at burners, deg. F.	163.00	141.00	50.50
Air Observations.			
Fireroom press., in. of water	2.34	4.91	4.96
Fireroom temp., deg. Fahr.	62.00	74.00	64.00
Stack temperature	418.00	475.00	520.00
Smoke, Ringelmann scale	0.10	0.10	0.10
Flue Gas Analysis.			
Carbon dioxide	12.48	12.61	13.14
Oxygen	3.08	2.97	1.89
Carbon monoxide	.....	.....	.....
Nitrogen (by difference)	84.44	84.42	84.97
Calculated Results.			
Moisture in steam, fraction of 1 per cent	0.616	0.606	0.69
Factor of evaporation	1.0738	1.1466	1.089
Pounds of water evaporated per lb. of oil	15.59	14.37	14.89
Pounds of water evaporated from and at 212 deg. Fahr. per lb. of oil:			
For oil of 19,379 B. T. U.	16.73	16.48	16.21
Reduced to 19,500 B. T. U.	16.41	16.17	15.90
Water evaporated per sq. ft. of heating surface per hr., actual	5,342	7.964	10.415
Water evaporated per sq. ft. of heating surface per hr., from and at 212 deg. F.	5.736	9.131	11.34
Pounds of oil burned per sq. ft. of heating surface per hour	0.3427	0.5541	0.6996
Pounds of oil burned per cubic ft. of furn. per hr.	3.17	5.125	6.475
Boiler efficiency, per cent	81.68	80.45	79.13

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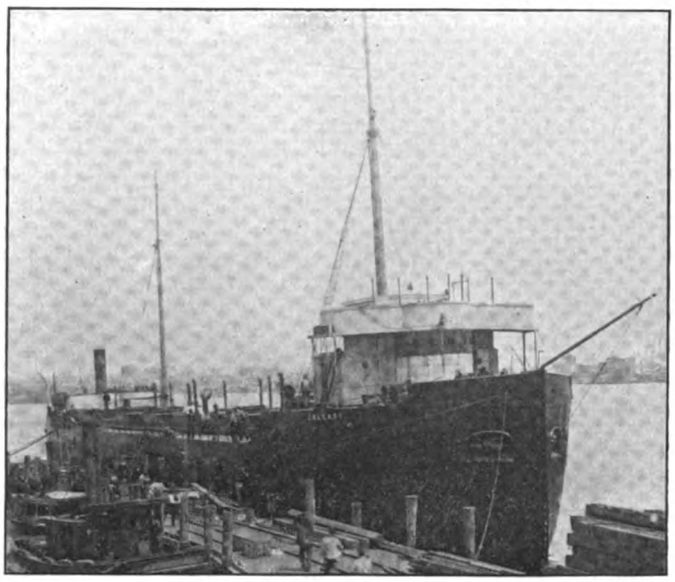
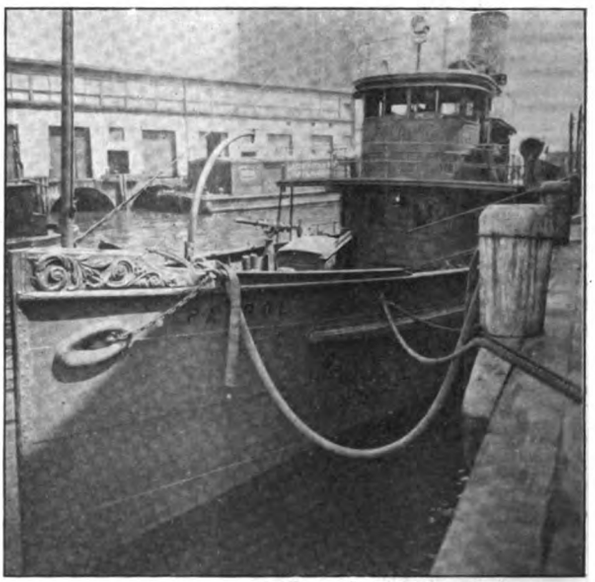
Latest Marine News in Pictures

Payment Will Be Made For Acceptable Photographs



MOTOR SHIP BACOI

This ship, formerly CALGARY, was purchased from the Great Lakes Transportation Co. by the Standard Oil Co. BACOI has been equipped with diesel engines and will serve as an oil carrier.



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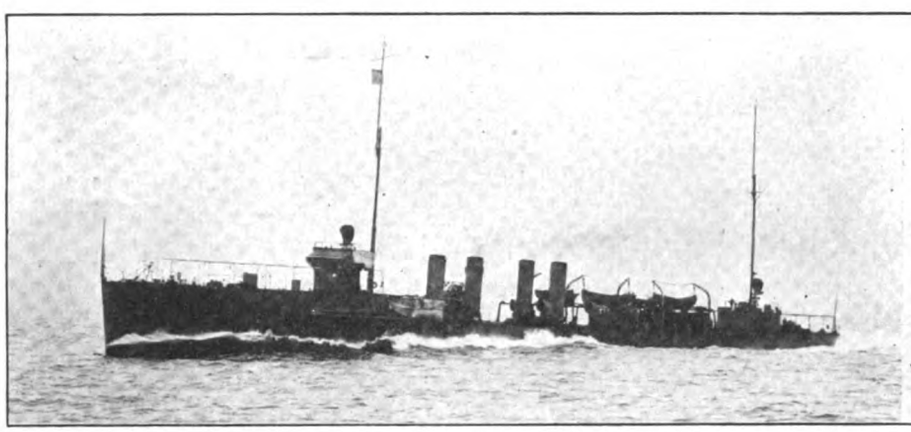
NEW YORK POLICE BOAT

PATROL is one of the fleet of speedy tugs used by the harbor police of New York. Since the outbreak of war these vessels have been on constant duty to prevent breaches of our neutrality.

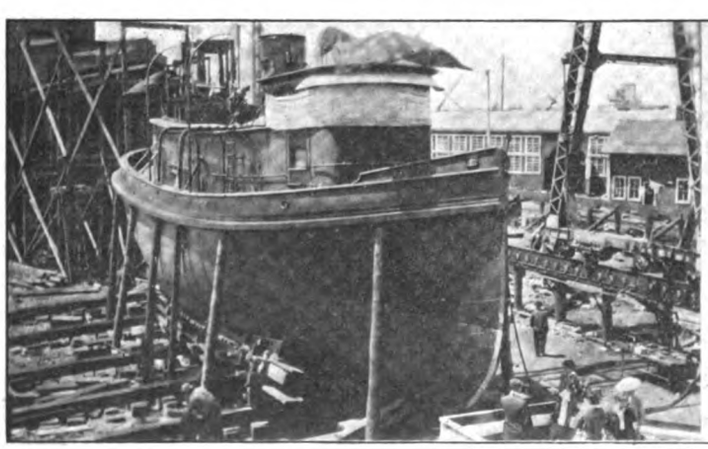


TORPEDO BOAT DESTROYER SAMPSON

SAMPSON is one of the newest additions to our flotilla of destroyers. She did 31.30 knots an hour on her trial. The government requires but 29.5.

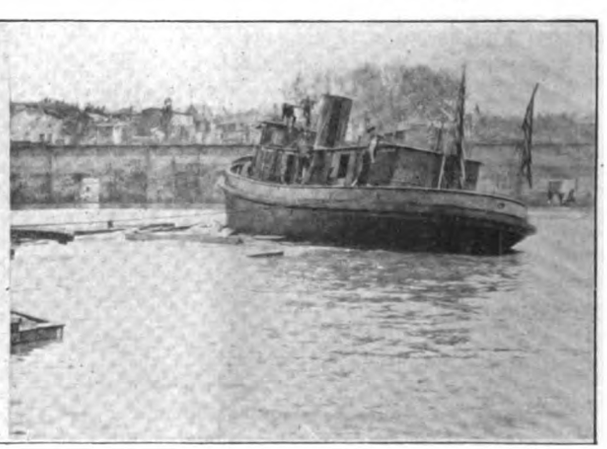
TUG SAMPSON

Commissioners of New Orleans' extensive municipal docks employ several of these trim ships.



FIRE TUG G. W. WALLACE

Sponsor preparing to christen vessel as she starts to slide into the water.



Righting herself after sliding from the ways.

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Photographs From Far and Near

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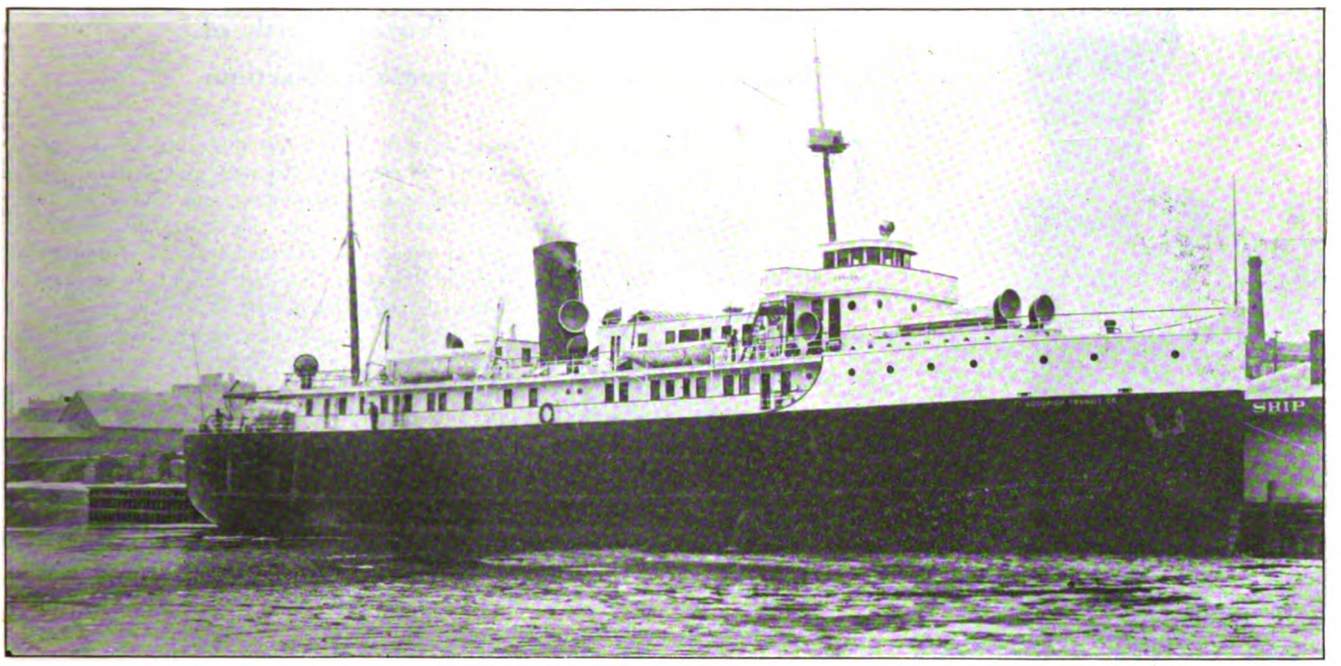
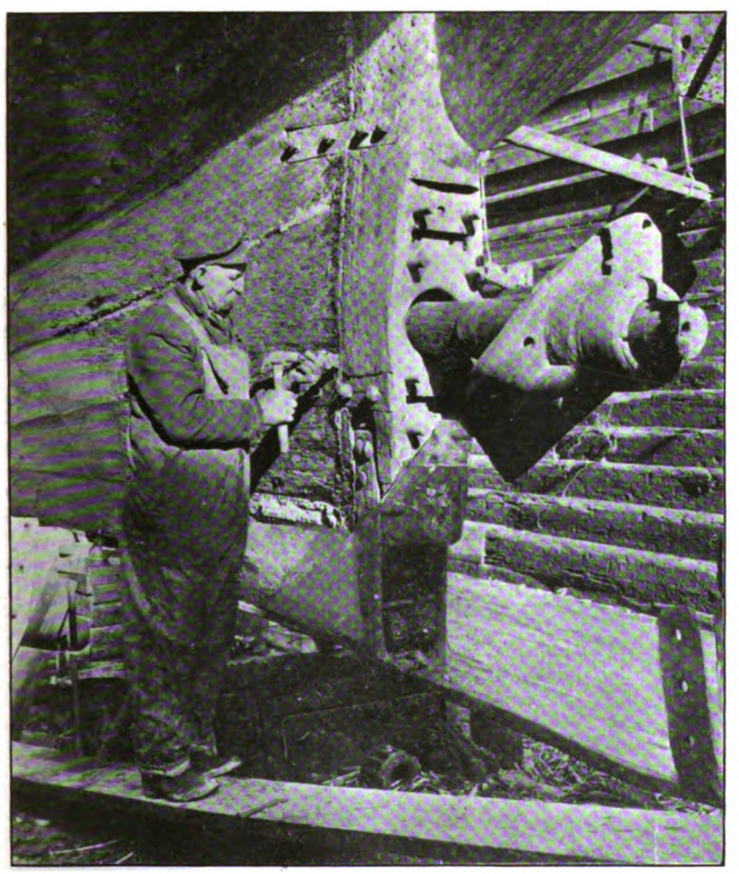


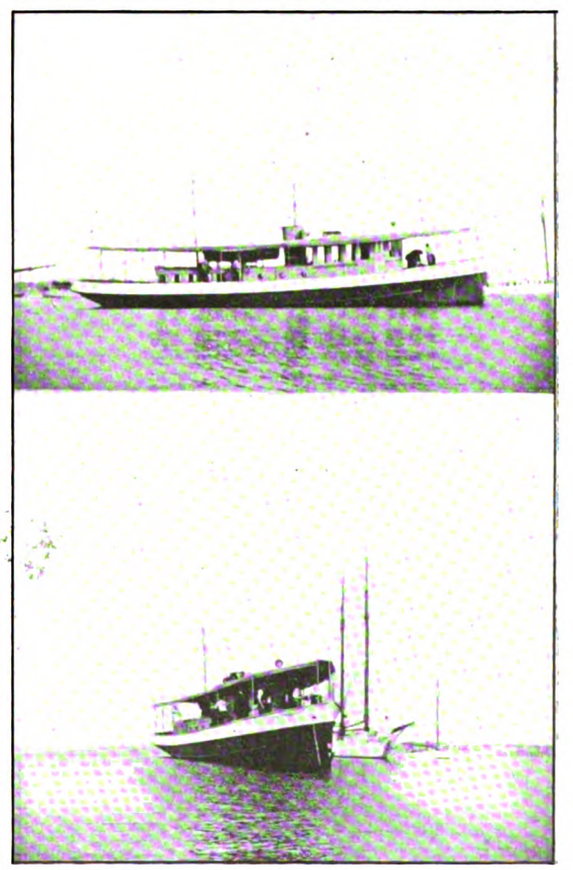
THE ICE OF THE GREAT LAKES HAS NO TERRORS FOR NEVADA

One of the new freight steamers recently built for winter service on Lake Michigan by the Manitowoc Ship Building & Dry Dock Co. for the Goodrich Transit Co. She helped to clear a channel through the ice this spring for the impatient lake fleet.



ONCE DISCARDED—NOW VALUABLE

Chipping out elastic cement or marine glue from the seams of an old steamer, discarded years ago, in preparation for recalking and putting her into service to secure a share of the tremendous profits of present ocean traffic.



PILOT BOAT ASSISTANT

Used by the government officials at New Orleans. Her trim lines are revealed in the bow-on view at the bottom.

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First Undersea Trader Reaches U. S.

German Submarine Deutschland on Peaceful Mission to America Proves Worth of Craft for Commercial Purposes in Wartime

Captain Paul Koenig
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THE arrival of the North German Lloyd merchant submarine DEUTSCHLAND at Baltimore harbor, July 9, marked a new epoch in maritime affairs. And even aside from its purely commercial aspect, the event is of history-making import on account of the opportunity that it discloses for carrying on merchant shipping business uninterrupted by blockades. Fleets of commercial submarines built especially for war times will undoubtedly be built by several of the more important nations. The arrival of the German undersea boat with its valuable cargo has proved to other powers the need of unarmed submarines for commercial use.

DEUTSCHLAND, whose 16-day trip across the Atlantic is hailed as one of the greatest achievements of the century, is approximately 315 feet long. When on the surface, she is able to maintain a speed of more than 14 knots. According to her master, Captain Paul Koenig, the vessel displaces 2,000 tons, the gross tonnage being 791. The crew numbers 29 men, including three officers.

When leaving Bremen DEUTSCHLAND is said to have carried 180 tons of fuel oil and 20 tons of water. Upon arrival at Baltimore there was still a supply of 95 tons of fuel and 10 tons of water. As the trip represented a mileage of about 3,800, it is evident that the storage capacity of the vessel is entirely adequate for much more extensive voyages.

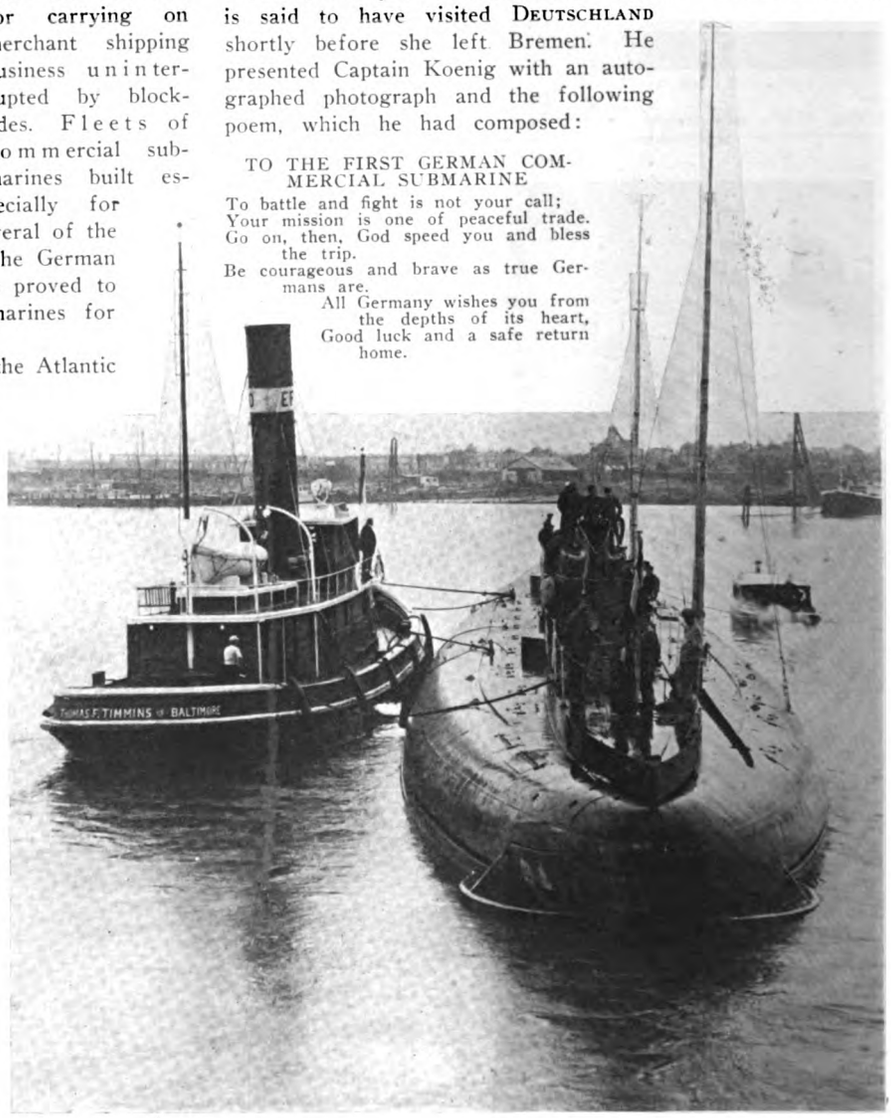
DEUTSCHLAND is propelled by twin screws driven by two 600-horsepower diesel engines. The space usually devoted to torpedoes and guns on the ordinary type of submarine is utilized in DEUTSCHLAND for the cargo. It is said that 1,500 tons of freight may be carried on the super-submarine merchantman. She can submerge in less than two minutes.

Captain Koenig is well known on this side of the ocean, having commanded SCHLESWIG, NECKAR and RHEIN, plying between German ports and Baltimore, and PRINCESS IRENE on the New York to Germany run. He states that DEUTSCHLAND is the first of several submarines built to the order of the Deutsche Ozean Rheiterie Gesellschaft mit Beschraenkter Haftung, Bremen. A second submersible, BREMEN, will follow shortly. According to the master, the idea of building DEUTSCHLAND originated with Alfred Lohmann, president of the Bremen chamber of commerce, and a company was formed to build the submarine at Kiel. DEUTSCHLAND is equipped with life boats and life belts. Forward of the conning tower she carries a life boat with belts, accommodations and provisions for 23 men. A smaller boat, aft of the conning tower, has accommodations for six men. These boats can be launched in two minutes.

Prince Henry of Prussia, brother of the German emperor, is said to have visited DEUTSCHLAND shortly before she left Bremen. He presented Captain Koenig with an autographed photograph and the following poem, which he had composed:

TO THE FIRST GERMAN COMMERCIAL SUBMARINE

To battle and fight is not your call;
Your mission is one of peaceful trade.
Go on, then, God speed you and bless the trip.
Be courageous and brave as true Germans are.
All Germany wishes you from the depths of its heart,
Good luck and a safe return home.



DEUTSCHLAND APPROACHING BALTIMORE IN TOW
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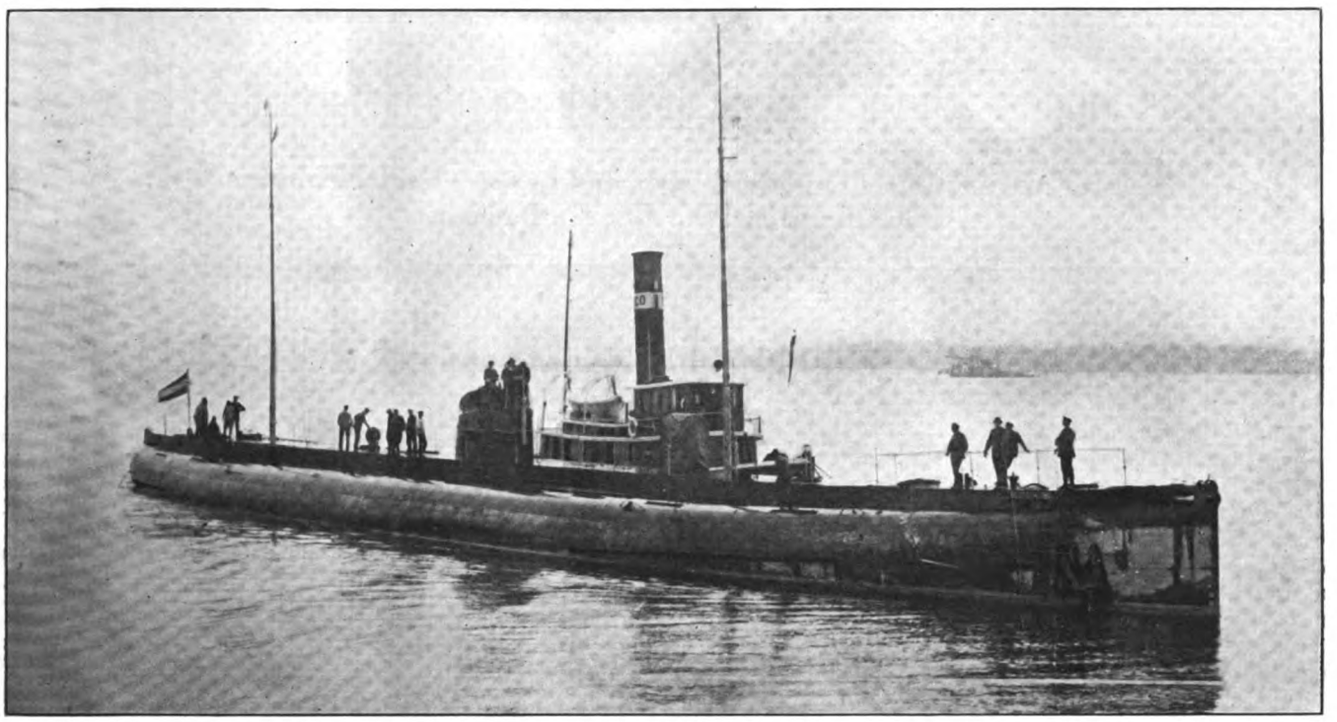

DEUTSCHLAND ON DAY OF ARRIVAL. SMOKESTACK IS THAT OF TUG TIMMINS
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The ship's manifest showed her gross tonnage (by measurement allowing one ton to each hundred cubic feet) was 791 and her net tonnage 447. She carried 3,042 cases of dyestuffs, and about 300 tons of scrap iron as ballast. The weight of the cargo was estimated at 500 tons and the value at about $1,000,000.

According to one official who visited DEUTSCHLAND, she has a 17-foot depth of hold for her cargo. The crew occupies bunks on either side of a narrow passageway leading to the officers' quarters. The captain's room is said to be only 6 feet square. Mess rooms and galley are of corresponding size. She is equipped with cargo winches and tackle.

DEUTSCHLAND'S trip recalls similar exploits made during the war by submersibles of more warlike character. Most notable of these was the trip of U-51 from Wilhelmshaven to the Dardanelles, a distance of 4,000 miles. Her commander, Captain Otto Hershing, took the boat safely through the bay of Biscay, the strait of Gibraltar, and the Mediterranean, and after sinking the battleships TRIUMPH and MAJESTIC, reached Constantinople in safety. A few weeks ago U-35 reached Cartagena, Spain, with a message from the Kaiser to King Alfonso. This boat covered a distance of 1,500 miles without stopping for supplies. On Oct. 3, 1915, the United States sent K-3, K-4, K-7 and K-8 from San Francisco to Honolulu. They were escorted by the cruiser MARYLAND, collier NANSHAN, tug IROQUOIS and torpedo boat destroyer LAWRENCE. The trip of 2,100 miles required 11 days. In June, 1915, a flotilla of 10 American-designed English submarines made the trip from Quebec across the Atlantic ocean to England without mishap. The flotilla was divided into two groups of five vessels each.

CREW APPARENTLY WERE GLAD TO REACH AMERICA
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In the Traffic Manager's Office

A Review of the Month on Coasts and Lakes—Useful Pointers for the Men Who Get the Business

More U. S. Trade Borne in Own Ships

THE active interest taken by American capitalists during the past two years in extending this country's merchant marine, has resulted in largely increasing the proportion of our foreign trade carried in American bottoms. The latest figures issued by the government show that 29 per cent of our ocean-borne import trade was carried in American ships during April. The National Foreign Trade Council recently pointed out that of our total sea-borne trade in the year ending June 30, 1914, only 8 2-3 per cent was carried under the American flag. The immense progress made since that time, as evidenced by the April figures, is illustrative of the success of private capital in meeting emergencies brought on by the war.

Increase Continues

The record of 29 per cent in April of this year, compares with 19 per cent in April, 1915. For the 10 months ending with April, 1914, the per cent of the ocean-borne import trade handled by American ships was only 12 per cent. This figure increased to 18 per cent for the corresponding period ending with April, 1915, and to 21 per cent for that ending with April, 1916. The increase has been continuous for many months.

The government statistics show that the total net tonnage of vessels entered at American ports in the foreign trade of the country during the 10 months ending April, 1916, was 41,125,861, of which American ships represented 13,956,583 net tons, or about 34 per cent. During the corresponding period of the preceding year the net tonnage entered in the foreign trade amounted to 38,055,499 net tons, of which the American share was 10,441,189, or slightly more than 27 per cent. The percentage of American ships in the totals for April, 1915, and April, 1916, was approximately 25 and 30, respectively.

British ships continue to handle more American imports than the ships of any other nation, but, whereas, during the 10-month period, ending April, 1914, vessels flying the British flag brought to the United States merchandise more than four times as valuable as that imported in American bottoms, the latest records indicate that the American merchant marine is carrying more than half as much of the import trade as Great Britain's. This is attributable principally to the gain by American vessels, as the loss of British ships is comparatively small.

Japan's Shipping Grows

Japanese and Norwegian vessels are more actively engaged in transporting goods to American ports than those of any other nations except Great Britain and the United States. The rise of Japan in the trade has been rapid, her interests having increased almost threefold since 1914, while Norway's share has more than doubled. During the last 10-month period, only vessels of these four nations shared in the trade to a value of more than $100,000,000. Dutch shipping made rapid strides last year, but has fallen off in 1916, while the German merchant fleet, ranking second to Great Britain in its interest in American trade in 1914, has become a negligible factor.

The following table gives a comparison of the value of imports for April, 1915, and April, 1916:

APRIL IMPORT COMPARISON.

Imports—	April. 1915.	April. 1916.
American vessels	$28,924,615	$43,862,746
Foreign vessels—		
Austrian	$296	$376
Belgian	405,528	19,516
British	69,352,138	77,908,083
Danish	.....	6,543,948
Dutch	10,089,574	11,449,009
French	5,424,815	8,543,567
German	26,706	119,339
Italian	5,395,088	3,798,226
Japanese	6,857,244	19,398,202
Norwegian	13,704,356	15,683,675
Spanish	.....	1,694,672
All other	10,933,255	10,879,300
Total foreign	$122,189,000	$156,037,913

The following table compares imports carried in American and foreign vessels during the 10-month periods ending April, 1914; April, 1915, and April, 1916 (000 omitted):

SEASON IMPORT COMPARISON

Imports—	Ten months ending April. 1914.	1915.	1916.
American vessels	$168,137	$221,204	$339,682
Foreign vessels—			
Austrian	$19,576	$3,022	$5
Belgian	30,869	6,364	2,598
British	702,226	574,516	671,325
Danish	.....	.....	38,887
Dutch	57,334	106,107	79,220
French	98,214	57,741	72,756
German	200,572	31,044	339
Italian	31,026	41,493	38,192
Japanese	45,754	52,686	134,921
Norwegian	52,232	87,818	118,532
Spanish	.....	.....	11,106
All others	38,384	69,231	65,010
Total foreign	$1,276,200	$1,030,026	$1,222,687

The following tables show the net tonnage of vessels cleared and entered in the foreign trade of the United States during April, 1915, and April, 1916 (000 omitted):

APRIL TONNAGE COMPARISON

Countries for which cleared:	April, 1915 American	April, 1915 Foreign	April, 1916 American	April, 1916 Foreign
Europe	68	1,683	88	1,420
North America	895	777	1,101	753
South America	70	136	97	131
Asia	3	91	18	119
Oceania	8	57	16	56
Africa	1	30	15	25
Countries from which entered:				
Europe	82	1,724	85	1,456
North America	750	749	897	747
South America	80	129	77	122
Asia	33	127	5	110
Oceania	13	50	16	28
Africa	5	94	4	78

The net tonnage of vessels cleared and entered in the foreign trade of the United States during the 10 months ending April, 1915, and the 10 months ending last April, is shown in the following table (000 omitted):

SEASON TONNAGE COMPARISON

Countries for which cleared:	Ten months ending April. 1915 American	1915 Foreign	1916 American	1916 Foreign
Europe	736	14,726	904	15,268
North America	9,389	10,070	12,098	9,080
South America	362	1,037	761	1,391
Asia	30	844	97	1,208
Oceania	52	451	127	515
Africa	24	318	64	311
Countries from which entered:				
Europe	594	13,667	780	14,542
North America	9,247	10,178	12,162	9,065
South America	359	1,771	711	1,380
Asia	151	1,175	100	990
Oceania	72	325	151	363
Africa	15	495	49	826

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New Cunard Offices

The Cunard Steamship Co., Liverpool, Eng., has just completed a new office building on Pier Head, Liverpool. The new Cunard building embodies in general outline and architectural detail the prominent features of the Italian renaissance as represented in the Farnese palace in Rome. The simplicity and dignity of the structure make it very impressive. The building is seven stories high, 170 x 330 feet, and includes a basement and two sub-basements. The floor space area of the various floors aggregates approximately 20 acres.

The details of the interior decorations are said to be particularly beautiful. The main ground floor halls are lined with marble, the columns are of Greek design. The screens and counters are of Italian marble from the Armi Alto quarries. The public offices for first class travel are on the ground floor, the second class passenger offices are in the basement and the executives' offices are on the fifth floor. The remainder of the building with the exception of the two sub-basements is to be leased to tenants.

Regulation of Spanish Line

The contract of the Spanish government with the Compania Transatlantica, known in the United States as the Spanish line, made on June 1, 1910, has been modified by a royal order published May 23, 1916. The company is authorized to use the vessels stipulated in the contract as forming the Philippine line and other vessels necessary in order to make 21 trips between Spain and New York before the end of the current year, beginning with one voyage in May, two in June, and during the rest of the year three a month.

One departure must be from a Mediterranean Spanish port and another from a Cantabrian Spanish port, and the return trip made to those ports to which the cargo is chiefly consigned, in order that the vessels shall make no voyage in ballast. Barcelona and Cadiz will be the Mediterranean ports served and Bilbao and Vigo the Cantabrian. The usual time to remain in New York harbor is fixed at eight days, but if the Spanish government finds that more time is required for cargo, or for any other reason, this limit may be extended; also, if it be found advantageous to visit ports in the United States other than New York, this may be done at the company's discretion. The Compania Transatlantica plans to make six more voyages to the Philippines during the remainder of the year, leaving Barcelona during the first days of every month, and five return voyages from Manila. If, through accident or other circumstance, the company cannot make the trips to the Philippines without reducing the voyages to New York, it may reduce its trips to the Philippines to one sailing every six or eight weeks, or even suspend the service. The company will receive no subvention other than that for the Philippine line.

In both the New York and the Philippine service and on the coastwise runs, of the company, foreign vessels may be utilized by the company if satisfactory arrangements to this effect can be made. In all the carrying trade preference must be given to Spanish importation and exportation. On vessels making a return voyage from New York half of the space for freight will be reserved for wheat, corn, coal and ammunition up until 15 days before sailing. The directors general of commerce or the military intendant general can requisition more space, compensating for the excess on another voyage, so that on an average half of the capacity of the vessels shall be available to carry the freight mentioned. If, before the time fixed, this space is not engaged it may be filled with other freight for Spain. The wheat, corn and coal will be carried at reduced rates of freight, which will be fixed monthly by a duly qualified Spanish board of transportation that will determine what cargoes may profit by the reserved space, the discount on the freight and the order of preference between them, informing the company of its decision in advance.

Building Ships in Japan

DETAILED information concerning the development of the ship building industry in Japan is contained in a report from Vice-Consul M. D. Kirjassoff, stationed at Yokohama, which emphasizes the difficulties under which ship construction is now being carried on due to the lack of raw materials. The great demand for skilled labor has caused a considerable advance in the wages paid.

During the fiscal year ended March 31, 1916, the imperial Japanese government granted ship building subsidies amounting to 1,600,000 yen ($797,600). Fifteen ships, with a total tonnage of 68,104, received this subsidy, a decrease of 1 in the number of ships, as compared with the preceding fiscal year, but an increase of about 3,000 in the total tonnage.

Of these 15 ships, 4 each are owned by the Nippon Yusen Kaisha and the Osaka Shosen Kaisha, with a total tonnage of 25,951 and 25,311, respectively. The two largest vessels built during the year, MANILA MARU, 9,505 tons, and HAWAII MARU, 9,482 tons, both owned by the Osaka Shosen Kaisha, have been put on the American run, the former to Tacoma and the latter to Honolulu and San Francisco.

Ship building in Japan has been greatly retarded by the difficulty of securing supplies. The fact that the export of steel is prohibited from Great Britain is chiefly responsible for this condition. Ship builders are not so greatly inconvenienced by the scarcity of plates, but the prohibition of the export of keels and frames of ships hampers the industry.

Dr. J. Imaoka, the head of the shipping section in the department of communications, is reported as saying that unless some effectual measures be immediately taken the ship building industry will soon be paralyzed. In his opinion the shortage is due to the decreased imports from England and to the shortage of bottoms to bring supplies to Japan. He suggests that ship builders cooperate in securing materials required and dispatch ships to bring home their purchases abroad. To this end Mr. Matsukata of the Kawasaki Dock Yard Co., Kobe, and others will go to the United States.

In some places timber is being used as a substitute for steel sections, especially at the smaller yards, where wooden ships are being built in increasing numbers. The use of timber is, however, limited as it is impracticable to build ships of more than 1,000 tons of wood.

In spite of the lack of materials the extension of ship building plants in Japan is going on at an enormous rate. During the past few months the number of docks for ships of 1,000 tons or upward has increased from 18 to 37. Of these, five are at the Osaka Iron Works, two at the Mitsubishi Dockyard in Kobe, six at the Mitsubishi Dockyard in Nagasaki, six at the Kawasaki Dockyard, six at the Inoshima Works, and two each at the Watsuo Iron Works, the Ono Iron Works, Fuji-Nagata Dockyard,

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Uraga Dockyard, Ishikawajima Dockyard and Harima Dockyard.

Ship building mechanics in Japan number about 40,000, of whom the Mitsubishi Dockyard of Kobe and Nagasaki, and the Kawasaki Dockyard employ 10,000 each, the Osaka Iron Works 9,000, and the other dockyards the remaining 11,000. As a result of the extension of ship building plants, the demand for skilled hands has greatly increased, and, according to the Japanese newspapers, wages have increased by about 10 per cent, now averaging between 70 sen (about $0.349) and 75 sen (about $0.374) per day, and increased wages may soon be demanded."

The new city pier at Stapleton, Staten Island, New York harbor, has been leased by R. Martens & Co., Inc., for 30 years at an annual rental of $42,000 for the first 10 years, and increasing rentals for each succeeding 10 years. The pier is 1,300 feet long and will accommodate four average-sized cargo steamers. It has a depth of 30 feet on each side of the pier at mean low water. Like many other piers along the waterfront, the Martens pier is piled high with freight awaiting shipment to Europe.

American Ship Building in Past 12 Months

The bureau of navigation, department of commerce, reports 1,030 vessels of 347,847 gross tons were built in the United States and officially numbered during the fiscal year ended June 30, 1916, compared with 1,266 vessels of 215,711 gross tons during the fiscal year ended June 30, 1915.

The seaboard yards have built 35 large steel merchant steamers aggregating 191,859 gross tons, the largest merchant steel output in their history. Of these, 21 steamers are each over 5,000 gross tons, the largest being H. H. ROGERS of 10,050 gross tons, and 14 are between 3,000 and 5,000 gross tons each. The Newport News, Va., Ship Building & Dry Dock Co. built six of 40,329 gross, Maryland Steel Co., Sparrows Point, Md., eight of 35,665 gross, Union Iron Works, San Francisco, Cal., five of 32,665 gross, New York Ship Building Co., Camden, N. J., seven of 32,164 gross, and Fore River Ship Building Co., Quincy, Mass., four of 24,932 gross. The Newport News, Camden and Quincy yards were also engaged in naval construction.

Of these steel ocean steamers, 24 of 138,858 gross tons have been registered for foreign trade, eight of 34,386 gross tons enrolled for the coasting trade, one, PACIFIC of 6,034 gross tons, was sold to Norwegians and up to June 30 the two remaining had not been documented.

Of the output of the Great Lakes, eight vessels of 14,775 gross tons are each under 2,500 tons, built for the ocean trade of which four are for foreign trade and one MORRIS ADLER 2,481 gross, has been sold to Norwegians.

The accompanying table shows the detailed statement according to material, power (gasoline included under steam) and place of construction for the fiscal year ended June 30, 1916, compared with the previous fiscal year.

America's Two-Year Ship Building Record

FISCAL YEAR ENDED JUNE 30, 1916

	Atlantic and Gulf		Pacific		Great Lakes		Western rivers		Total	
	Number	Gross	Number	Gross	Number	Gross	Number	Gross	Number	Gross
Wood:										
Sailing	44	14,208	3	1,879	..	....	..	....	47	16,087
Steam	242	7,107	172	8,426	82	1,350	98	1,898	594	18,781
Unrigged	159	49,053	77	10,054	20	3,060	29	677	285	62,844
Total	445	70,368	252	20,359	102	4,410	127	2,575	926	97,712
Metal:										
Steam	47	162,237	6	32,887	23	48,079	10	2,009	86	245,212
Unrigged	5	2,723	..	....	7	2,117	6	83	18	4,923
Total	52	164,960	6	32,887	30	50,196	16	2,092	104	250,135
Totals:										
Sailing	44	14,208	3	1,879	..	....	..	....	47	16,087
Steam	289	169,344	178	41,313	105	49,429	108	3,907	680	263,993
Unrigged	164	51,776	77	10,054	27	5,177	35	760	303	67,767
Grand total...	497	235,328	258	53,246	132	54,606	143	4,667	1,030	347,847

FISCAL YEAR ENDED JUNE 30, 1915

	Atlantic and Gulf		Pacific		Great Lakes		Western rivers		Total	
	Number	Gross	Number	Gross	Number	Gross	Number	Gross	Number	Gross
Wood:										
Sailing	49	7,225	1	16	..	....	..	....	50	7,241
Steam	297	8,297	237	13,612	103	2,029	106	3,144	743	27,082
Unrigged	205	51,515	101	4,187	35	3,727	14	194	355	59,623
Concrete	2	565	..	....	..	....	..	....	2	566
Total	553	67,602	339	17,815	138	5,756	120	3,338	1,150	94,511
Metal:										
Sailing	1	27	..	....	..	....	..	....	1	27
Steam	35	98,332	8	16,833	17	4,458	8	762	68	120,385
Unrigged	1	283	1	434	1	34	4	37	7	788
Total	37	98,642	9	17,267	18	4,492	12	799	76	121,200
Totals:										
Sailing	50	7,252	1	16	..	....	..	....	51	7,268
Steam	332	106,629	245	30,445	120	6,487	114	3,906	811	147,467
Unrigged	206	51,798	102	4,621	36	3,761	18	231	362	60,411
Concrete	2	565	..	....	..	....	..	....	2	565
Grand Total...	590	166,244	348	35,082	156	10,248	132	4,137	1,266	215,711

June Lake Levels

The United States Lake Survey reports the stages of the Great Lakes for the month of June, 1916, as follows:

Lakes	Feet above mean sea level
Superior	603.48
Michigan and Huron	580.94
Erie	573.26
Ontario	247.86

Lake Superior is 0.48 foot higher than last month, 1.56 feet higher than a year ago, 1.28 feet above the average stage of June of the last ten years, 0.05 foot above the high stage of June, 1876, and 2.24 feet above the low stage of June, 1879. During the last ten years the June level has averaged 0.3 foot higher than the May level and 0.2 foot lower than the July level.

Lakes Michigan and Huron are 0.45 foot higher than last month, 1.15 feet higher than a year ago, 0.12 foot above the average stage of June of the last ten years, 2.66 feet below the high stage of June, 1886, and 1.04 feet above the low stage of June, 1896. During the last ten years the June level has averaged 0.2 foot higher than the May level and about the same as the July level.

Lake Erie is 0.39 foot higher than last month, 1.41 feet higher than a year ago, 0.41 foot above the average stage of June of the last ten years, 1.26 feet below the high stage of June, 1876, and 1.69 feet above the low stage of June, 1895. During the last ten years the June level has averaged 0.1 foot higher than the May level and 0.1 foot higher than the July level.

Lake Ontario is 0.73 foot higher than last month, 2.74 feet higher than a year ago, 0.96 foot above the average stage of June of the last ten years, 0.77 foot below the high stage of June, 1870, and 2.97 feet above the low stage of June, 1895. During the last ten years the June level has averaged 0.1 foot higher than the May level and 0.1 foot higher than the July level.

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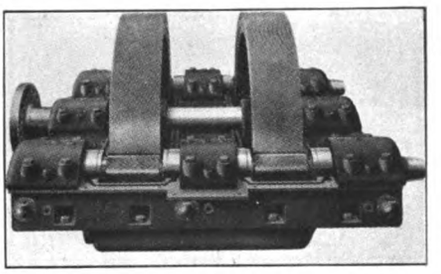
Steam Turbine Reduction Gears

Improved Reduction Gears Have Extended the Use of Turbines as a Means of Ship Propulsion—Description of Herringbone Gear

THE steam turbine has many desirable features which have led to its adoption for numerous phases of power application on both land and sea. The most prominent features are the economy of floor space, the absence of vibration, the simplicity of operation and the low cost of upkeep. Economy of operation is secured in part by the ability of the turbine to run under a high vacuum; it also is possible to secure an oil-free condensate for the boilers. All of these advantages are believed to apply with equal force to steam-turbine installations for marine service, but until recently the steam turbine has been used principally in high speed vessels, usually of large size, and in most cases the turbines were directly connected to the propeller shaft.

Owing to the difference between the turbine speed necessary for the highest efficiency and the proper propeller speed, direct connection of steam turbines to propellers requires a compromise speed which is not suitable for either the turbine or the propeller.

For low speed cargo-carrying boats, where the propeller speed in most cases does not exceed 125 revolutions per minute, it is obvious that direct connection of the turbines to the propeller would be impracticable. The



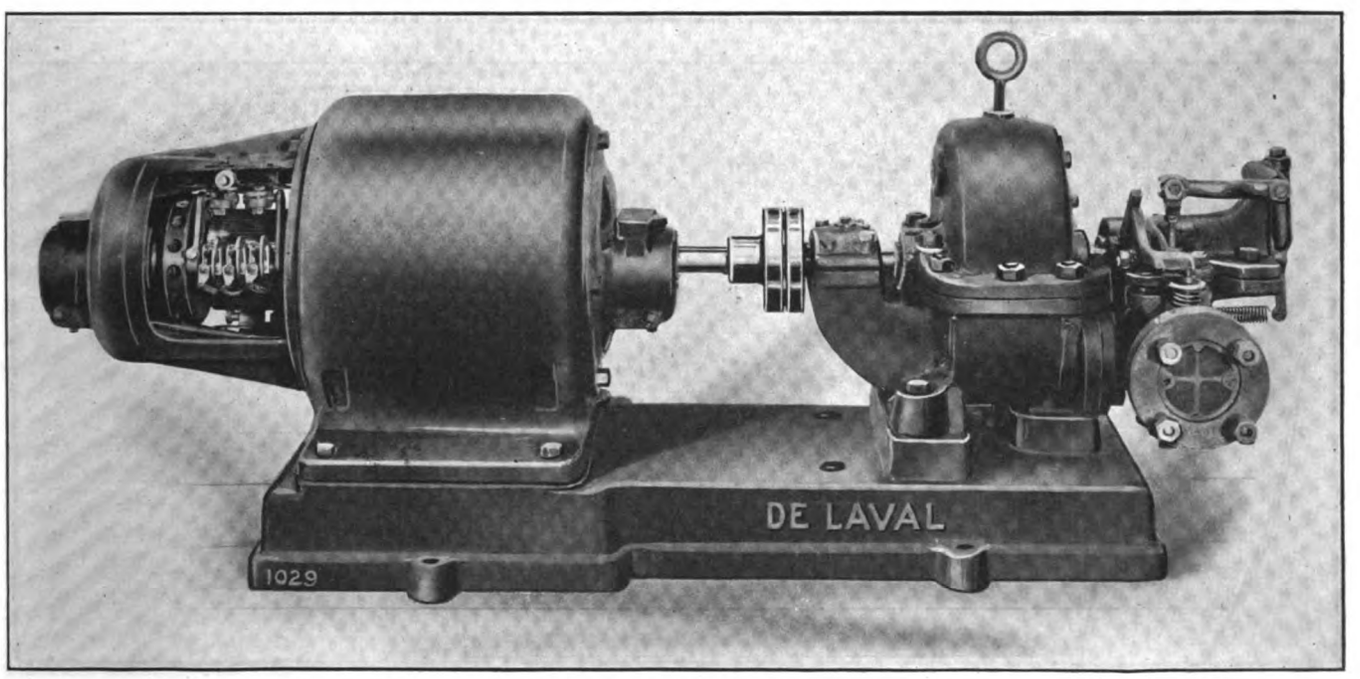
HERRINGBONE REDUCTION GEARS, WITH COVER REMOVED

logical solution, therefore, is to interpose speed reducing gears between the turbine and the propeller, which will permit both the turbine and the propeller to run at their most efficient speeds. The interpolation of reduction gears greatly reduces the weight and size of the turbine.

Flexibility in Turbine Applications

Flexibility of design is also possible, depending on the requirements of the installation, it being possible to design the turbine for moderate capacities in either one or two casings per propeller. By installing two turbines, one high pressure and the other low pressure, each provided with its own pinion operating on the gear connected to the propeller, a substantial duplication of driving machinery is obtained, since either half of the turbine can be operated independently on boiler steam, if this is so desired. The De Laval Steam Turbine Co., Trenton, N. J., which has been engaged for some years, in the development of high speed, double-helical, speed-reducing gears for steam turbine service, is building a number of large gear reduction sets for marine service. One outfit under construction consists of two 2,500 horsepower reduction gears to be installed in a twin-screw freighter. Each unit consists of two pinions operating at 2,200 revolutions per minute on one gear running at 110 revolutions per minute. The De Laval company also is supplying the gears for two 17½-knot, 10,000-ton, passenger boats, each screw requiring 4,500 horsepower. The gear reduction for each propeller consists of two pinions operating on a main gear, the pinions running at 1,500 revolutions per minute and the gear and propeller at 120 revolutions per minute. For each reduction, one pinion is operated by a high-pressure turbine and the second pinion by a low-pressure turbine.

An essential feature of these reduction gears is the use of gears and pinions rigidly supported in the casing. This construction is advisable, as any resiliency or flexibility between gear and pinion results in unequal pressure and wear, and the most effective means of insuring



TURBO-DRIVEN GENERATOR

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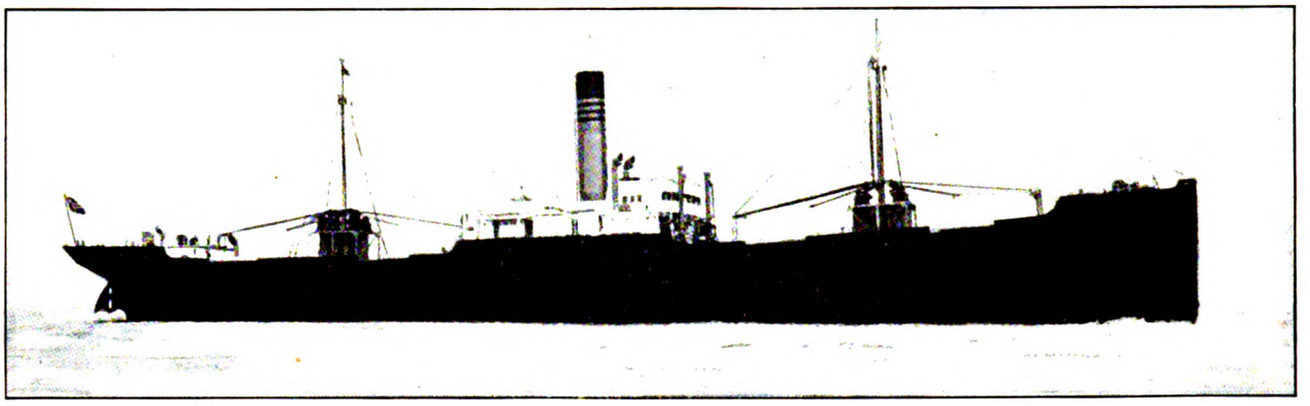


STEAMSHIP PACIFIC, TURBO-DRIVEN, USING REDUCTION GEARS

smooth, quiet running and long life is found in the use of the proper methods for producing the correct pitch, tooth angles, and tooth contour. To this end the De Laval Steam Turbine Co. has developed special designs of gear-cutting apparatus and methods of cutting, which are said to have proved satisfactory in many installations.

If rigidly supported, gear teeth which have been correctly formed and proportioned to give moderate tooth pressures, usually will retain their original correct contours and will operate noiselessly, efficiently and without vibration at the speeds necessary for steam-turbine, geared service. A flexible pinion support to compensate for incorrectly formed teeth or any distortion in the gear casing is not desirable, for the masses of the pinion and the supporting frame are so large, and the interval in which any adjustment would have to be made is so small, that the pinion cannot accommodate itself well to inequalities while in rapid rotation without setting up destructive forces. This has been amply demonstrated by years of experience, not only in this country, but also abroad, where the best practice advises only the use of rigidly supported gears.

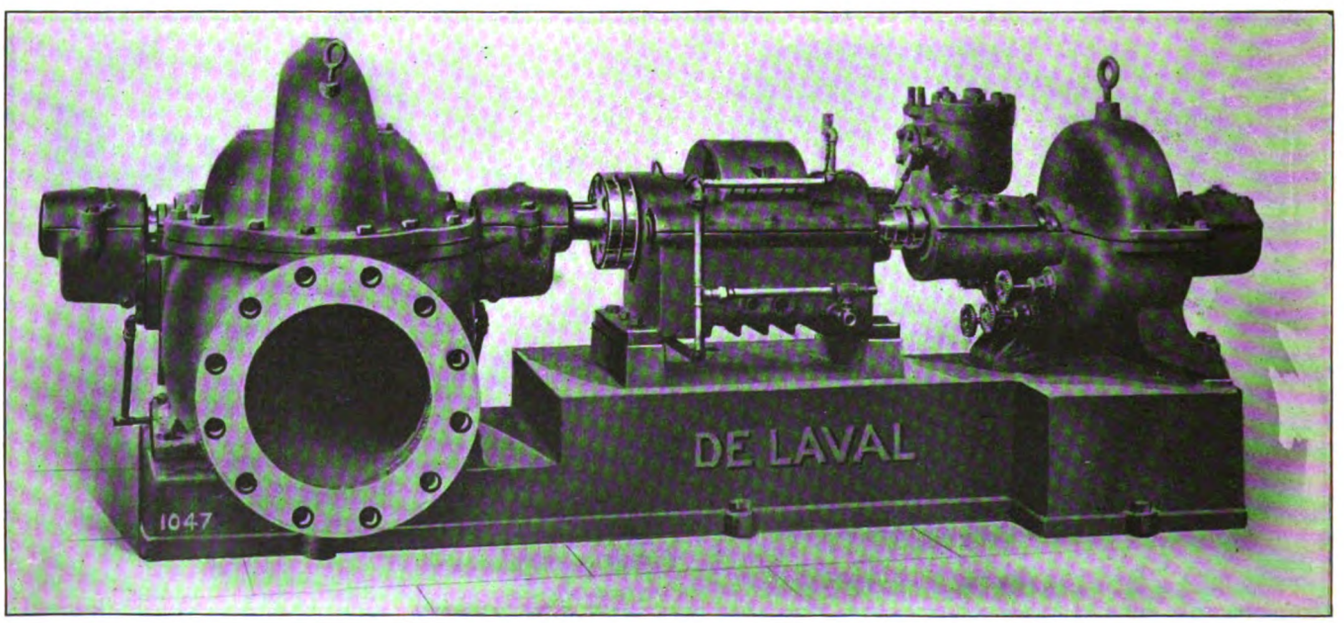
Construction of Gears

The De Laval double helical gears are cut upon special machines designed and built by the company for this purpose. After cutting, each gear is tested for correct angle, correct shape of teeth and correct pitch. No scraping or hand work is permitted on the tooth surface, since such hand work produces imperfect contours. After cutting, the gear teeth are carefully polished by special processes to eliminate the small inequalities left by the cutting tools, without altering the profile of the teeth.

The gear teeth are cut upon seamless rolled steel bands shrunk upon either a cast iron or cast steel center. The gear bands are of heat-treated steel. The pinions are cut directly on the pinion shaft, which is a chrome-nickel steel forging, oil tempered to have a hardness much greater than that of the gear bands, in order to have different qualities of metals in contact and to insure long life to the pinion. The entire gear, after assembly, is carefully tested for static and running balance.

The gear and pinions are lubricated by oil sprays projected against the line of contact of the gear teeth on the entering side. The oiling device may be examined and cleaned conveniently, without lifting the gear case cover or disturbing any of the other parts.

Keepers of United States coast guard stations at Lorain, O.; Fairport Harbor, O.; Frankfort, Mich.; Aransas Station, Port Aransas, Tex., and Quoddy Head Station, South Lubec, Me., have been specially designated to assist in the examination of applicants for certificates of efficiency as lifeboat men, in addition to those previously designated.



REDUCTION GEARS USED ON TURBO-DRIVEN CENTRIFUGAL PUMP

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Lake Mishaps in First Half of 1916

Number of Accidents About Equal to that for Corresponding Period of 1915 but Monetary Loss Less

THE number of accidents which occurred on the Great Lakes and connecting waters during the first six months of 1916, was about equal to the number which occurred during that period in 1915. The monetary loss, however, was not as great, both as regards total losses and serious accidents, although the loss of life was unfortunately much greater. Five lives were lost in 1915 as against 20 this year.

Total losses numbered three; the Canadian steamer CITY OF MIDLAND, the steamer S. R. KIRBY and the steamer PANTHER. CITY OF MIDLAND, owned by the Canada Steamship Lines, Ltd., Montreal, Que., was destroyed by fire at Collingwood, Ont., on March 17. She was insured for $60,000. S. R. KIRBY, belonging to the North Western Transportation Co., H. H. Brown & Co., Cleveland, managers, foundered in a gale near Eagle Harbor, Lake Superior, on May 8, after breaking in two. Twenty of her crew were lost, only two being saved. KIRBY was insured for $143,000 and was the first loss of the navigation season of 1916. PANTHER was sunk in collision with the steamer J. J. HILL off Parisian Island, Whitefish Bay, June 26, carrying down a cargo of 65,000 bushels of wheat.

Collision Most Frequent Cause

Collision figured as a prominent cause in the list of casualties, claiming 25 accidents out of a total of 111. Strandings and groundings also were very numerous, while fire, deranged steering gear, engine room difficulties and similar mishaps were lesser contributing causes. Among the more serious accidents was the stranding of car ferry PERE MARQUETTE 19 on Jan. 17. This vessel stranded in a storm when her engines became disabled, sustaining damage estimated at $60,000. Another heavy financial loss before the opening of the navigation season was that growing out of the bunching of boats in an ice jam at Buffalo on March 27, when the steamer ANNA C. MINCH was torn from her moorings, crashing into the steamer THEODORE H. WICKWIRE JR. and dragged her down stream. These two vessels, in passing, hit the steamers COWLE, HART and LEWISTON, and the combined damage to all vessels was estimated at $30,000, MINCH and WICKWIRE JR. sustaining the greater losses.

Accidents to Lake Vessels in First Half of 1916

Date.	Name of Vessel.	Nature of Accident	Location.
Jan. 17.	C. F. Pere Marquette 19..	Stranded in snow storm; engine disabled; port bilge pushed up about 150 feet; released Jan. 29 and towed to Ludington; damage estimated at $60,000; docked at Manitowoc.....	Lake Michigan, near Big Point Sauble.
Feb. 7.	Str. W. G. Pollock.....	Hit by steamer Steel King, which dragged her anchor and broke away from her moorings; forward cabin damaged.....	Buffalo.
.....	Str. Ann Arbor 4.....	Damaged both tail shafts while bucking ice; docked at Milwaukee	.....
Feb. 21.	Sch. J. S. Crouse.....	Hit by Ann Arbor 5 and slightly damaged.....	Manitowoc.
March 15.	Tug Clarence M. Lamb...	Ran aground in gale; released on 23rd, uninjured.....	Off Big Island, Sandusky Bay.
March 17.	Str. City of Midland.....	Destroyed by fire; insured for $60,000.....	Collingwood, Ont.
March 27.	Str. Anna C. Minch.....	Torn from her moorings by strong current in river, crashing into steamer Wickwire Jr. and carrying her down stream, blocking channel; stern plates badly damaged by cables when she broke loose and houses demolished; shoe and rudder damaged; about 10 days in dry dock.....	Buffalo.
March 27.	Str. Theo. H. Wickwire Jr.	Hit by steamer Minch, as indicated above; stern and starboard quarter badly damaged.....	Buffalo.
March 27.	Str. John B. Cowle.....	Caught in Wickwire-Minch mixup on this date; three plates damaged	Buffalo.
March 27.	Str. Hart	Slightly damaged in ice jam.....	Buffalo.
March 27.	Str. Lewiston	Slightly damaged in ice jam.....	Buffalo.
March 29.	Str. James Laughlin.....	Broke adrift in ice jam; not damaged.....	Fairport.
April 4.	Str. W. B. Schiller.....	Damaged by fire; loss, $500.....	Toledo.
April 15.	Tug W. G. Mason.....	Companionway forward stove in by gale and heavy sea.....	Off Saginaw Bay.
April ...	Str. Marion	Stopped at Mackinaw City on 19th for repairs, having lost her shoe enroute to Port Huron; towed by tug from Port Huron to Cleveland; docked April 22.....	.....
April 22.	Str. Clifford F. Moll.....	Collided in ice with steamer John J. Boland; stern damaged; stopped at Ecorse for temporary repairs.....	Lake Erie.
April 22.	Str. John J. Boland.....	Hit by steamer Moll; stern damaged.....	Lake Erie.
April 22.	Str. C. L. Hutchinson....	Struck by steamer Central West; 4 plates on starboard side damaged; docked at Lorain, leaving there on April 27; damage estimated at $6,000.....	Lorain.
April 22.	Tug Osborne	Picked up a cable in her wheel, which was later removed by a diver	Black river, Lorain.
April ...	Str. Yuma	Hit steamer Mecosta; slightly damaged.....	Milwaukee.
April 23.	Str. Zenith City.....	Ran ashore; released on 25th after lightering 900 tons of coal; reloaded lightered tonnage; leaked in forepeak; docked at Toledo May 18; 15 plates damaged.....	Nine Mile Point, Lake Huron.
April ...	Str. Luzon	Ran ashore, loaded with corn; released on 25th.....	Pyramid Pt., Lake Michigan.
April ...	Str. John P. Reiss.....	Ran aground, loaded with coal; released on 24th.....	Long Tail Pt., Green Bay.
April ...	Str. Collingwood	Ran ashore, downbound, grain laden; released by tugs; not damaged	Above Whitefish Point, Lake Superior.

(Continued on page 282)

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Accidents to Lake Vessels in First Half of 1916

(Continued from page 281)

Date.	Name of Vessel.	Nature of Accident	Location.
April 23.	Str. G. J. Grammer.....	Ran aground; released, uninjured.....	Russell Island, St. Clair river
April 24.	Str. W. L. King.....	Knocked four buckets off her wheel in ice.....	Lake Erie.
April 24.	Str. E. W. Oglebay.....	Ran aground; released on 25th after lightering part of her coal cargo	Peche Island, St. Clair river.
April ...	Str. J. H. Bartow.....	Ran aground; released on 25th by tug, uninjured.....	Southeast Bend.
April 26.	Str. Edmonton	Broke her air pump while navigating through ice; towed to American Soo	Near Whitefish Pt., Lake Superior.
April ...	Str. Gen. Geo. A. Garretson	Ran ashore; released; not damaged.....	Whitefish Point, Lake Superior.
April ...	Str. Underwood	Ran aground; leaked badly when released, but proceeded to Duluth, arriving there on 28th; 44 floor frames damaged and several plates broken; repaired at Superior.....	Soo river.
April ...	Str. Sir Thos. Shaughnessy	Collided with steamer J. P. Morgan; neither vessel damaged....	St. Clair river.
April 27.	Bge. A. W. Thompson....	Broke her rudder; towed to Reid's dry dock for repairs.....	Lake Huron.
April 27.	Bge. Minnie E. Orton....	Carried away from Wolverine dry dock by running ice.....	St. Clair river.
April 28.	Str. Nottingham	Collided with steamer Wm. A. Rogers in ice pack; several plates cracked on starboard side aft; temporarily repaired at Sault	Whitefish Bay.
April 28.	Str. Wm. A. Rogers.....	Collided with steamer Nottingham in ice pack; hawse pipe broken	Whitefish Bay.
April ...	Str. J. H. Reed.....	Arrived at Ashtabula on April 28 with two buckets knocked off her wheel by ice.....	Lake Erie.
April 28.	Str. Alex. Thompson.....	Ran aground, blocking traffic for 10 hours; not damaged.....	Maumee river, Toledo.
April 28.	Bge. Auxiliary	Rammed by steamer L. R. Davidson and sank; steamer was loading cargo when struck.....	Buffalo river.
April 28.	Str. L. R. Davidson.....	Collided with barge Auxiliary; stem of steamer damaged; repaired at Superior shipyard.....	Buffalo.
April 29.	Str. C. Russell Hubbard..	Driven by wind against south pier at upper entrance; several plates damaged	Sault Ste. Marie, Mich.
April 29.	C. F. Marquette & Bessemer No. 2.....	While leaving harbor in dense fog, crashed into east end of new pier head on west breakwall; eight plates and five frames in bow damaged; docked at Ashtabula.....	Conneaut.
April 29.	Str. Alpena	While leaving harbor, broke casting on steering gear and stopped for temporary repairs.....	Conneaut.
April ...	Str. James H. Prentice....	Struck heavy cake of ice, springing leak; sank; loaded with coal	St. Clair river, near Algonac.
April 30.	Str. Yosemite	Ran aground, downbound; released May 1 after lightering about 20,000 bushels grain	St. Clair river.
April 30.	Str. W. J. Averell.....	Upbound, carried away two gates of Lock 8; steamer not damaged	Welland canal.
May ...	Str. A. A. Augustus.....	Broke her shoe in ice and lost her rudder; docked at Ecorse May 1	Lake Erie.
May 1.	Str. W. H. Wolf (Wood).	Blew high pressure cylinder while landing at a coal dock	Chicago.
May ...	Str. George N. Orr.....	Ran aground; released May 3 by tugs.....	Russell Isd., St. Clair river.
May 3.	Str. F. E. Harvey.....	Collided with unknown vessel; stem and hawse pipes broken; repairs estimated at $10,000.....	Detroit river.
May 3.	Str. John Dunn Jr.....	Steering gear disabled, causing her to sheer and run on bank, abreast of Sarnia water works; released herself; steering gear repaired and proceeded.....	Detroit river.
May ...	Str. Sinaloa	Wheel worked loose, disabling steamer; arrived at Duluth May 5 in tow of steamer Philbin; repaired at Superior.....	.....
May ...	Str. Lackawanna	Ran aground	Below East Neebish Rapids
May 6.	Str. F .W. Fletcher.....	Ran aground while leaving port.....	Marinette, Wis.
May 6.	Str. I. L. Ellwood.....	Damaged shoe and rudder; arrived at Lorain May 9, in tow of steamer S. F. B. Morse, and was docked; six plates removed in making repairs; repairs completed May 15.....	Calcite, Mich.
May 7.	Str. Pentland	Ran on rocks in foggy weather; released May 8 after lightering part of her coal cargo; reloaded lightered cargo; docked at Cleveland May 15 for bottom repairs.....	Morgan Point, Lake Ontario.
May 8.	Str. S. R. Kirby.....	Foundered in terrific gale, after breaking in two; 20 lives lost; Two of crew saved; insured for $143,000; total loss.....	Lake Superior near Eagle Harbor.
May 8.	Bge. Hartnell	In tow of steamer S. R. Kirby; picked up by steamer E. H. Utley and towed to Soo; towing machine broke and lost steel hawser; temporarily repaired at Soo; towed to Lake Erie, running aground in Detroit river on 16th; repaired at Cleveland	Lake Superior.
May 8.	Str. E. B. Osler.....	Ran aground in heavy gale.....	Lower St. Mary's river.
May 10.	Str. Harvard	Ran aground; released on 12th, after lightering about 100 tons of ore; steamer not damaged.....	Huron.
May 11.	Str. Mariska	Lost her rudder in big gale; picked up by steamer Alex. McDougall and towed to Detour, leaving there on 13th for Collingwood; docked at Collingwood May 14.....	Off Saginaw Bay.
May ...	Str. Charles S. Hebard...	Hit anchor of steamer William Siemens, damaging two plates; repaired at Cleveland.....	Superior.
May ...	Str. P. A. B. Widener...	Collided with steamer J. E. Upson, damaging her slightly; Widener stopped at Lorain yard for minor repairs June 6....	Hog Lake.

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Accidents to Lake Vessels in First Half of 1916

(Continued from page 282)

Date.	Name of Vessel.	Nature of Accident	Location.
May 11.	Str. Quebec	Collided with steamer Montreal; repaired at Montreal; damaged estimated at $1,000	Sorel, Que.
May 13.	Str. Frank E. Kirby	Hit by steamer Tionesta while she was backing out; considerably damaged around paddle box	Detroit.
May 12.	Str. Saronic	Blew out cylinder head, disabling engine; picked up by steamer E. N. Ohl and towed to Bete Brise Bay and from there by tugs to Port Arthur	Lake Superior.
May ...	Str. Saskatoon	Struck; arrived at Kingston, leaking badly; bow damaged; docked at Cleveland May 15, leaving on 18th; four plates repaired	Soulanges canal.
May ...	Str. W. M. Egan	Struck, damaging wheel and forefoot	Welland canal.
May ...	Str. T. H. Wickwire	Collided with steamer W. E. Corey; damaged her starboard side, abreast of Texas; Corey not damaged	Canadian Soo canal.
May ...	Str. Boston	Struck; four plates and 10 floor frames damaged; repaired at Superior	Buffalo.
May ...	Str. J. B. Ketchum	Ran ashore; repaired at Cleveland	Lake Ontario.
May 17.	Str. W. L. Smith	Ran aground	Entrance to Sandusky Bay.
May 17.	Str. W. R. Stafford	Became disabled when connecting rod broke; picked up by a tug and towed to Cleveland for repairs	Off Lorain, Lake Erie.
May 17.	Str. Rock Ferry	Ran ashore	Duck Lake, Ont.
May 18.	Str. Centurion	Steering gear became disabled; struck bank and punctured No. 1 tank; worked down through channel, but leaked so badly that she was beached in 22 feet of water on east bank near lightship; damaged on starboard side; pumped out and patched up; docked at Lorain May 22, leaving dry dock on 29th	Livingstone channel.
May 18.	Str. La Salle	Damaged wheel and leaked	.....
May 18.	Str. Put-in-Bay	Ran aground; released, uninjured, by a tug	Sandusky.
May 23.	Str. Harry Jones	Ran aground in fog; released herself	Lower end St. Clair Flats canal
May 23.	Str. F. B. Squire	While shifting, backed into a dock, breaking quadrant and twisting rudder stock	Buffalo.
May ...	Str. Peter White	Hit a concrete dock and cracked a plate; break patched up and steamer came down	Superior, Wis.
May 24.	Ferry boat Welcome	Steering gear broke; drifted down river several hundred yards, until picked up by Str. International	Niagara river.
May 27.	Str. Flagg	Ran aground in fog; released by tugs, uninjured	St. Mary's river, near Detour.
May ...	Str. E. L. Wallace	Collided with steamer George B. Leonard; one plate damaged; repaired and sailed	Buffalo.
May ...	Str. Byron Whitaker	Ran aground; released after lightering 150 tons coal; shoe damaged; towed to Montreal by tug	Soulanges canal.
May 31.	Bge. Our Son	Current caused her to hit head gates of Michigan Northern Power Co.'s canal; stern smashed and rudder broken; planks sprung, causing bad leak; lumber cargo loaded onto another steamer; repaired at Soo	Soo.
May 31.	Str. Wissahickon	Collided with steamer Allegheny	Buffalo harbor.
June 2.	Bge. John A. Roebling	Ran aground in strong gale; released by tugs June 3; not damaged	Sweet's Point, St. Mary's river
June 3.	Sch. Lucia A. Simpson	Crashed into steamer Schuylkill, which was tied to dock; jib of schooner shattered	Milwaukee.
June 3.	Str. Schuylkill	Collided with schooner Lucia Simpson; slightly damaged	Milwaukee.
June 3.	Str. W. C. Richardson	While making turn, transmission cable fouled and disabled her steering gear; ran aground; released by two tugs and lighter after eight hours' work	Middle Ground, Detroit river.
June 4.	Str. A. W. Osborne	Broke her crankshaft between high pressure and intermediate cylinders; arrived at Lorain on 17th for repairs, leaving on 20th	Off Middle Island, Lake Huron.
June ...	Str. Neptune	Ran ashore	Simmons reef.
June 7.	Str. Steel King	Hit a pier and damaged one plate	Soo.
June 7.	Str. Frank O'Connor	Collided with Lake Shore Railroad bridge; towed to Toledo shipyard for repairs	Toledo.
June 7.	Bge. I. L. Bell	Hit middle pier (in tow of tugs); repaired at Cleveland; five plates damaged	Soo.
June 7.	Bge. Martha	Ran aground; released, uninjured	Soo.
June 7.	Tug Buffalo	Steam valve broke, disabling vessel; rescued June 8 and towed into Erie by U. S. Life Guard station	Lake Erie, off Erie.
June ...	Str. Joseph	Ran aground; leaked slightly; released by tug	Lake Ontario, near Niagara.
June 7.	Str. James E. Davidson	Collided with steamer P. P. Miller; three plates damaged and hawse pipe broken; Miller slightly damaged	Off Thunder Bay, Lake Huron
June 8.	Str. Hamonic	Struck obstruction, breaking two buckets off wheel; repaired at Detroit	Near Fort Gratiot, Detroit river
June 11.	Str. R. W. England	Ran ashore; released on 13th after lightering 700 tons of ore	Near Ashland, Lake Superior.
June ...	Tug Gladstone	Ran ashore; released by tug on June 11 and towed to Bay City	East Presque Isle Harbor.
June 11.	Str. John Stanton	Collided with steamer W. H. Wolf; badly damaged about stern; repaired at Superior ship yard	Soo.
June 13.	Str. City of Grand Haven	Arrived at Chicago on 14th, having lost deck load of 9,000 ties in storm	Lake Michigan.
June ...	Str. James A. Farrell	Hit by car ferry M. & B. No. 2; one plate damaged. Car ferry slightly damaged	Conneaut.

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Accidents to Lake Vessels in First Half of 1916

(Concluded from page 283)

Date.	Name of Vessel.	Nature of Accident	Location.
June 17.	Str. W. B. Schiller.....	Collided with a tug and scow, damaging one plate; docked at Lorain June 19 and left on 21st.....	Detroit river.
June 21.	Bge. Thomas Gawn.....	Hit by steamer W. H. Truesdale while unloading lumber; slightly damaged; Truesdale not damaged.....	St. Clair Flats canal.
June ...	Str. Briton	About 25,000 bushels grain damaged through fire in hold, caused by leaving lighted candle in hold after leaving port.....	.....
June 24.	Str. D. M. Philbin.....	Steering gear disabled; stopped at Detroit for repairs.....	Detroit river.
June 25.	Str. John Owen.....	While entering third lock, struck center pier as result of sheer, breaking several plates on port bow.....	Soo.
June ...	Str. Saturn	Collided with carferry Pere Marquette 4.....	Milwaukee.
June ...	Str. Adrian Iselin.....	Struck a rock; leaked slightly.....	St. Lawrence river.
June 26.	Str. Panther	Collided with steamer J. J. Hill, being struck amidships; crew rescued; when steamer Hill backed away, Panther listed and sank in 70 fathoms of water; loaded with 65,000 bushels wheat	Off Parisian Island, Whitefish Bay.
June 26.	Str. J. J. Hill.....	Collided with steamer Panther; slightly damaged.....	Off Parisian Island, Whitefish Bay.
June 27.	Str. Glenlivet	Ran ashore; released on 29th and docked at Collingwood on 30th	Georgian Bay.
June 29.	Str. India	Carried away two upper gates of lock 12; docked for repairs..	Welland canal.

Mexico Has Only 42 Ships

THE Mexican crisis has served to attract attention to the condition of the shipping industry of Mexico. The Latin republic depends almost entirely upon foreign shipping to handle its trade. This dependence is indicated by the statistics of her merchant marine for 1915-16. Her merchant fleet is made up of 42 vessels with an aggregate gross tonnage of 39,294. Five of these ships are wood, with a total gross tonnage of 1,120; six are iron, with a tonnage of 3,070; and the remaining 31 are of steel, averaging slightly more than 1,000 gross tons. Only 13 Mexican vessels have a gross tonnage of more than 1,000, the largest being SAN ANTONIO of 5,251 gross tons. No other ship of 4,000 gross tons or more is included in the fleet.

Aside from the shipments handled by the railroads, which constitute a fair proportion of the trade of the United States with Mexico, commerce between these two countries is carried on largely in American bottoms. The Ward line operates a regular weekly service to Vera Cruz and Tampico, dispatching alternately a passenger ship and a cargo vessel. This line handles much of the trade done between Mexico and the Atlantic seaboard of the United States. The Compania Transatlantica (the Spanish Line) touches at Vera Cruz but does not carry any freight from New York to Mexico. In addition to this, the trade is served principally by independent operators of chartered ships as business offers, and on the west coast by a regular service.

The net tonnage of vessels cleared from ports of the United States in the trade with Mexico during the 10 months ending last April was 1,702,137, of which American ships contributed 1,278,049 tons, according to figures just issued by the department of commerce. This compares with a total of 1,419,250 net tons during the corresponding period of 1914-15, when American tonnage represented only 659,527 net tons and foreign tonnage 759,723. Due to conditions of shipping arising from the war in Europe, foreign tonnage decreased to only 424,088 net tons during the last 10 months, so that, in case of war with Mexico, the United States would control most of the tonnage engaged in the trade between the two countries.

Iron Ore Shipments

Ore shipments on the Great Lakes during June aggregated 9,507,576 tons, breaking the record for monthly shipments established by the May movement of 8,449,580 tons. Up to July 1, of the present season, 19,615,567 tons of ore were brought down from the upper lakes district, compared with 11,521,283 tons carried to July 1, 1915, an increase of 8,094,284 tons. In 1913, the record year in the ore trade, the movement to July 1 was 16,125,042 tons, shipments for the entire season amounting to 49,070,478 tons. Assuming, therefore, that the shipments from July 1 to the close of the present season will be equivalent to those of 1913, the ore movement in 1916 would be approximately 52,500,000 tons. However, some of the leading ore shippers expect that the movement from July 1 to the close of the season will be large enough to bring 1916 shipments up to 55,000,000 tons.

Following are the shipments by ports, with corresponding data for 1915:

Port.	June, 1915.	June, 1916.
Escanaba	720,264	1,159,424
Marquette	363,637	539,327
Ashland	604,127	1,101,370
Superior	926,536	1,945,234
Duluth 2,146,501		3,116,665
Two Harbors 1,244,026		1,645,556
	6,005,091	9,507,576
1916 increase		3,502,485

Port.	To July 1, 1915.	To July 1, 1916.
Escanaba 1,248,830		2,602,824
Marquette 547,002		1,154,140
Ashland 1,161,792		2,204,263
Superior 1,777,600		3,878,915
Duluth 4,295,811		6,325,990
Two Harbors 2,490,248		3,449,435
	11,521,283	19,615,567
1916 increase		8,094,284

Lake Erie Receipts

Out of a total of 9,507,576 gross tons of iron ore shipped on the Great Lakes during June, 7,823,704 tons were delivered at Lake Erie ports, as follows:

Port	Gross tons
*Buffalo	1,248,874
Erie	134,004
Conneaut	1,623,599
Ashtabula	1,682,482
Fairport	426,628
Cleveland	1,563,662
Lorain	659,420
Huron	197,693
Toledo	233,857
Detroit	53,485
Total	7,823,704

* Includes receipts at Port Colborne.

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What the Government is Doing

Rulings on Marine Matters **Improvements to Waterways**

Hints to Navigators

How Governments Aid Their Shipping

AMERICAN shipping now has an opportunity such as England had 50 years ago, according to a report on "Government Aid to Merchant Shipping" just made public by the bureau of foreign and domestic commerce. This opportunity, says the report, comes at a time when American citizens owning foreign-built ships can ply them under the American flag, when interest in foreign trade is widespread, the necessity for foreign markets clearly recognized, and the profitableness of shipping under present conditions is alluring.

The report was written for the bureau by Special Agent Grosvenor M. Jones, author of several recent works on shipping, and is the only recent work which covers the subject completely. It is one result of the present widespread discussion of ways and means of building up an American merchant marine. It aims to make clear just what the several governments have done to assist shipping. The information presented covers all forms of state aid to shipping, attention being called not only to subsidies and subventions, but to the various forms of indirect government assistance, such as the reservation of the coasting trade to national ships, exemptions from import duties, port dues, and taxation, the privilege of using foreign-built ships, preferential railroad rates, and loans to ship owners.

The reservation of coasting trade to national ships is one of the effective ways in which governments have helped their merchant marine, says the report. The United States, France, Italy, Austria-Hungary, Spain, and Belgium, among the more important maritime countries, have long reserved their coasting trade, while Japan has reserved all of its coasting trade only since 1910. Russia has long reserved the trade between Russian ports on the same sea, but it was not until 1897 that the trade between all Russian ports was restricted to ships flying the Russian flag For many years no country of importance other than the United States has required that ships flying the national flag shall be of domestic construction, although practically every country has made this requirement in the case of steamships receiving postal subventions. England has granted registers to foreign-built ships, in other words has pursued the free-ship policy, since about 1850. At that time, it is interesting to note, wooden sailing vessels were predominant and these could be secured more cheaply in the United States, which had larger supplies of timber and naval stores and a more efficient ship building industry. As a result of this free-ship policy the merchant marine of England received large accessions during the civil war, when more than 750,000 tons of American shipping secured English registers to avoid capture or destruction.

Differential Railroad Rates

Assistance in the form of lower rail rates on goods shipped over specified steamship lines is a practice that has been followed in Germany in the case of the German Levant and the German East Africa Lines. These differentials have a double purpose, since by enabling German manufacturers to sell their products at lower prices in the countries reached by these lines they develop German trade and at the same time increase the traffic on the preferred steamship lines. France also has made use of differential export railroad rates to assist the development of certain steamship lines as well as to increase the country's foreign trade.

The policy of granting loans to ship owners at low interest or without interest was begun, it is believed, by Austria. The only instance of such a loan by the British government was that made to the Cunard Steamship Co. under the mail and admiralty subvention contract of 1903. Under this contract, the British government loaned the steamship company $12,652,900, for building two steamers that would be suitable for use by the admiralty and would be the fastest afloat. This loan brought into being LUSITANIA and MAURETANIA. The loan was made at the rate of 2¾ per cent which was about 2 per cent lower than the rate at which the company could have borrowed a similar amount in the open market.

Denmark and Belgium are the only important countries that have extended aid to shipping by granting exemptions from port dues or making reimbursements for them, although Denmark withdrew this privilege from the favored line in 1910. It is interesting to note that Belgium for many years previous to the war reimbursed the North German Lloyd, the Kosmos Line, and the United Steamship Co. of Copenhagen for all pilotage fees, port dues, etc., paid to Belgian and Dutch officials.

The policy of granting indirect aid to shipping by reimbursement of canal dues was instituted by Russia in 1879. This practice has been extended from time to time and now provides for the reimbursement of the full amount of the canal dues paid by Russian steamers bound for or sailing from any Russian port in the far east and for a reimbursement of two-thirds of the full dues paid by Russian steamers bound for or sailing from ports on the Indian ocean and non-Russian ports on the Pacific ocean. In the period from 1879 to 1906 the Austrian government expended about $4,400,000 in reimbursement of Suez canal dues paid by steamers of the Austrian Lloyd. The Swedish government is under contract to reimburse the Swedish East Asiatic Co. for 60 per cent of the Suez canal dues paid in 1915, 55 per cent of those paid in 1916, and 50 per cent of those paid in 1917. Italy refunds all Corinth canal dues paid by the ships of the Societa Nazionale di Servizi Marittimi. The French government reimburses the Compagnie des Messageries Maritimes for Suez canal dues.

Exemption from taxation is a form of indirect assistance granted by only

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Austria-Hungary and by a few of our own states. A notable law in New York state exempts from all taxation for state and local purposes all American-owned ships registered at any port in the state if engaged in the foreign trade of the United States. Corporations owning such ships are exempt until Dec. 31, 1922, from all taxation upon their stock, franchises and earnings. Alabama exempts all ships engaged in foreign commerce from taxation, while the state of Washington exempts all ships built or in process of construction in the coastwise as well as in the foreign trade of the United States.

The granting of postal subventions to steamship lines antedates the bounty or subsidy system and is in more general use throughout the world. Great Britain was probably the first to pay subventions of this kind, the first contract of the sort being made in 1838. The United States and France soon followed suit—the United States in 1847 and France in 1851. Germany did not adopt the policy until 1886, when a contract with the North German Lloyd was concluded. The purpose of mail subvention contracts is primarily to encourage the maintenance of fast mail services on regular routes and schedules. In many instances a motive of almost equal weight is that of maintaining the fastest possible communication between the mother country and her colonies. Incidentally a third object is commonly achieved, that of providing vessels suitable for auxiliary cruisers and transports in time of war, and, in many cases a fourth object, that of fostering the domestic ship building industry by requiring that the subventions shall be paid only to domestic-built ships. The purpose of the large grants made by the British government was not, however, merely to assist in the establishment of a steamship line for the line's sake, but more particularly to promote rapid communication between England and her American and Australian possessions. With only two important exceptions, all financial aid extended by the British government has been in the form of postal and admiralty subventions. The United States and Germany, whose merchant navies rank next to that of Great Britain, have extended financial aid to shipping only in the form of mail subventions. The largest of the German companies—the Hamburg-American line—has received comparatively little financial assistance from the German government.

The system of paying direct general bounties or subsidies to shipping lines may be said to have been instituted by France, which entered upon this policy in 1881, and has made a more extensive use of bounties than any other country. Italy, Austria-Hungary, Japan and Spain have followed the French plan, with indifferent success except in the case of Japan. Unquestionably the merchant marine of Japan has developed more rapidly during the last 35 years than that of any other nation, although the report calls attention to the fact that this development is in part due to the phenomenal development of Japanese industries in recent years.

There is much interesting data in the report relating to government-owned steamship lines, state control of privately owned steamship lines, and state participation in profits of steamship lines. For each country included in the report there is a complete history of government relations with the merchant marine, with statistics to show the results of the various policies. Modern tendencies are discussed at length. Attention is called to some specific opportunities that now exist for American shipping. For example, the west coast of South America imports large quantities of coal from Australia and Wales. Since the construction of the efficient coal-carrying railroads, such as the Norfolk & Western, the Chesapeake & Ohio, the Virginian, and the Carolina, Clinchfield & Ohio, Virginia steam coal of excellent quality can be delivered at low cost at the Atlantic seaboard ports of Norfolk, Newport News and Charleston, where it can be delivered to vessel quickly, efficiently and at low cost. It is believed that increasingly large quantities of this coal can be sold in Chile and Peru at lower cost than Australian or Welsh coal. If this proves to be the case, the vessels carrying coal from the United States can return with nitrates from Chile, copper from American-owned mines and smelters in Chile and Peru, tin ore from American-owned mines in Bolivia, and iron ore from American-owned mines in Chile. The development of coal exports would cause reductions in return freights (a factor which goes far toward accounting for the maritime supremacy of Great Britain) and aid American shipping.

A new rule has been adopted by the board of supervising inspectors of the United States steamboat inspection service and approved by the secretary of commerce which provides that it shall be the duty of the inspectors when inspecting or reinspecting vessels to carefully examine all air ports and deadlights in the hull and to satisfy themselves that they are safe.

Survey Work Retarded by Lack of Funds

The Boston Chamber of Commerce committee on maritime affairs has made an interesting report regarding the conditions in the United States coast and geodetic survey resulting from the fact that insufficient funds are available to carry on the work of this important department of the government in a proper manner. A petition signed by a large number of ship owners, ship agents and others interested in maritime affairs has been filed with the committee asking that congress be urged to adopt an amendment to the sundry civil appropriation bill which will provide the bureau with sufficient funds to supply important charts, to purchase five launches for wire dredge work along the coast and to replace the condemned vessel which, previous to its abandonment had been engaged in charting the Alaskan coast.

The unprecedented increase in American shipping during the last two years has resulted in a shortage of nautical maps which will become more pertinent with the growth of our merchant marine. During the present year, 30,000 more of these charts have been ordered than in previous years. The supply of some of the charts has been exhausted and many vessels sailing from Boston have been obliged to leave without government charts. The present demand for charts requires an appropriation for modern presses, chart paper and an increase in the working staff at Washington.

Certain portions of the New England coast are said to be in a condition which is dangerous to navigation. This is indicated by the discovery of a mass of rock close to the entrance of the main harbor of Boston. Old charts show 43 feet of water at this point, but at the present time there are but 28 feet. One such obstruction in an important channel may be the cause of a large loss of life and property. The survey in this district has been retarded by inadequate funds. Appropriations in the past have not permitted the bureau to purchase boats for this survey, but have made necessary the renting of small launches, equipping them for wire drag work.

The loss of vessels in Alaskan waters would be reduced considerably if reliable charts were available. But 3,000 miles out of 26,000 miles of coast line have been surveyed. The coastal waters of Alaska are becoming more important each year to the rest of the country owing to increased industrial activities in that territory.

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American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the Vessel Construction Field

Lake-Built Boat Sails for Norway

JOHAN MJELDE left Cleveland a few days ago on her long journey to Norway. GIJONES will follow in a few weeks, and in rapid succession three sister ships will sail from Detroit and one from South Chicago. The six vessels are all destined for Norwegian service, and were built or are under construction by the American Ship Building Co. at its Cleveland, Detroit and South Chicago yards.

The sailing of JOHAN MJELDE gives tangible evidence not only to the competency of American ship yards to meet the demands of foreign ship owners, but also to the ability of yards on the Great Lakes to build vessels for salt water service. The limiting restriction on this ability of the lake yards is the Welland canal connecting Lakes Erie and Ontario. This waterway arbitrarily restricts the size of vessels that can pass from the lakes to the ocean, except in cases where large boats are cut in two and rebuilt after the segments have sailed through the canal.

Lake yards have built many Welland canal size steamers in past years, but vessel construction on foreign account is largely a development of the conditions existing during recent months.

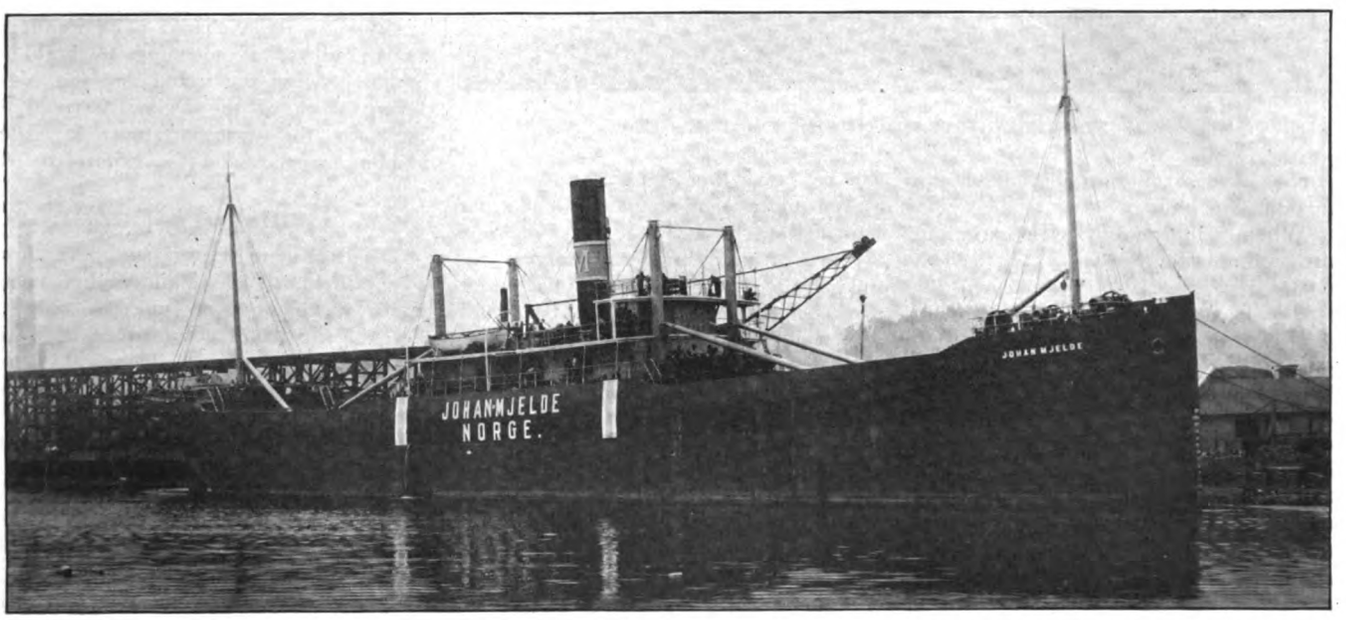
All of the boats are of the same type and dimensions, the length over all being 261 feet, length between perpendiculars, 251 feet, molded breadth, 43 feet 6 inches and molded depth, 20 feet. They are of the single-deck type with forecastle, bridge and poop. The propelling machinery is located amidships with the shaft tunnel running through the after hold.

Cargo Handling Equipment

Each of the two holds has two 18 x 28-foot hatches in the main deck, the coamings being 3 feet 6 inches high. The foremast is located on the after end of the forecastle and is fitted with one cargo beam and cargo winch. A derrick mast is located on each corner of the bridge, each mast being fitted with one boom. This arrangement gives two booms each to hatches Nos. 2 and 3. Each of these booms is equipped with a cargo winch. The mainmast is located on the forward end of the poop and is fitted with one boom and cargo winch which serves No. 4 hatch. All of these vessels are designed primarily for the lumber trade in the Baltic sea. For this reason the bulwarks are 5 feet 6 inches high, thus enabling large deck loads to be carried. The officers' store room, galley and mess room are located in a deck house on the bridge.

They are built to Lloyd's rules for ocean service and will carry approximately 3,200 gross tons deadweight. They are fitted with an electric light plant, steam and hand steering gear, windlass, ash hoists, etc. A 3-foot water bottom extends the full length.

The propelling machinery consists of one triple expansion engine with 20, 33 and 54-inch cylinders and 40-inch stroke. Steam is furnished at 180 pounds pressure by two Scotch boilers, 14 feet 6 inches in diameter and 11 feet long. Each boiler has three 42-inch Morrison furnaces. Natural draft is employed. The air pump is of the Edwards type. The pumping equipment comprises a 7 x 7 x 10-inch ballast pump, one 3½ x 20-inch bilge pump, one 6 x 4 x 6-inch pony pump and one main feed pump



NORWEGIAN OCEAN STEAMER BUILT AT THE CLEVELAND YARD OF THE AMERICAN SHIP BUILDING CO.

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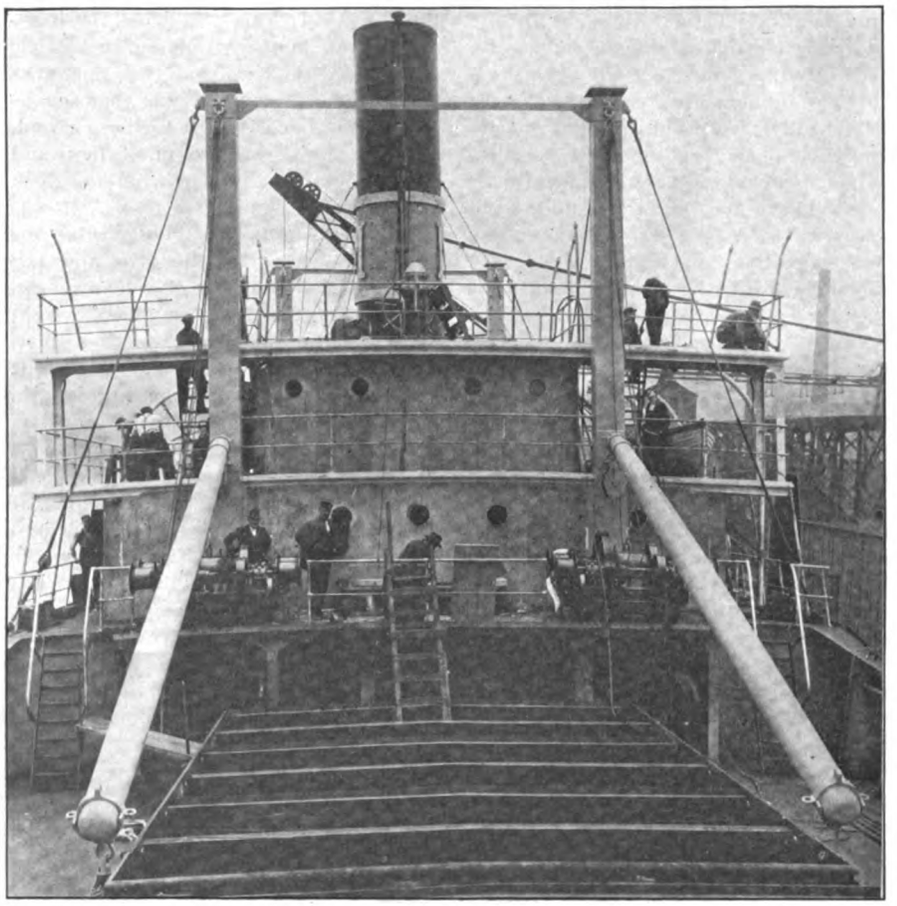
3½ x 20 inches in size. The propeller is 12 feet 6 inches in diameter with a pitch of 13 feet 3 inches and an expanded surface of 60 square feet.

Leases Yard---Saves Time

A director of the Texas Co., in commenting upon the present activity in ship building says:

"The company is making a saving of $150,000 each on vessels which it is building at the recently leased Sewall shipyards, Bath, Me. Moreover, delivery of the new ships will be made six months sooner than would have been possible from an outside ship builder.

"When additional vessels are put into commission we will have a fleet of 32 steamers, all of which will be used exclusively for the shipment of the company's product. We expect to have four new ships launched shortly".



BOW OF NORWEGIAN STEAMER BUILT ON THE GREAT LAKES

Ship Yards Combine

A new dry dock and ship building combination to be known as the Todd Shipyard Corporation, is being formed to combine Atlantic and Pacific coast properties. Articles of incorporation to be taken out in the near future will signalize the completion of the plan. The companies to be consolidated are the Robbins Dry Dock & Repair Co., Brooklyn, operating the largest repair yard for shipping in New York harbor; the Tietjen & Lang Dry Dock Co., Hoboken, N. J., the second largest in New York harbor, and the Seattle Dry Dock & Construction Co., which owns the second largest ship building and repair plant on the Pacific coast. The new company will have a capitalization of $6,500,000 in subsidiary bonds, $3,000,000 in new five-year, 6 per cent, convertible notes and $85,500 shares of common stock of no par value. The $3,000,000 of notes, which are convertible into stock at 100, will be dated June 15, 1916 and will be backed by a semi-annual sinking fund estimated to be at least 20 per cent of the net earnings after the interest and sinking fund charges on subsidiary company bonds and interest on the notes. The annual net earnings before charges are estimated at $3,000,000, which would net accruals for the sinking fund of over $460,000 annually. If this rate of earnings were maintained, most of the notes would be retired before maturity

Three steamers which the William Cramp & Son Ship & Engine Building Co., Philadelphia, is building for W. R. Grace & Co. will be used in inaugurating a passenger service from Atlantic coast ports to the west coast of South America. The vessels will each have accommodations for 100 first class passengers, and will make the run via the Panama canal to Callao in 11 days, and to Valparaiso in 18 days. The new vessels are of 10,000 tons cargo capacity.

Growth of Japanese Yard

Details of the development of the Mitsu Bishi Dockyard & Engine Works, Nagasaki, Japan, are contained in a report to the department of commerce from E. C. Baker, American consul in that district. He states that the yard is the largest in Japan, employing more than 10,000 of the 30,000 workmen engaged in ship building in that country and doing an enormous amount of repair work besides building ships. Mr. Baker reports as follows:

"The yard has docks ranging in length from 350 to 714 feet and a patent slip capable of lifting a vessel up to 1,000 tons gross. It also maintains a salvage steamer of 716 tons with a speed of 12 knots. The plant was considerably extended last year and still further extensions are planned."

Cramp Company Expands

Important enlargements of the plant of the William Cramp & Sons Ship & Engine Building Co., Philadelphia, are to be provided as a result of the acquirement by the company of 45 acres of land on Petty's island in the Delaware river which is situated directly opposite the present yard. The Cramp company proposes to build upon the site a large dry dock where vessels will be taken for launching. The present plant will be devoted exclusively to hull and repair work. A large ore refinery also will be built on Petty's island by the Crew-Levick Co., Philadelphia. The Pennsylvania railroad is planning to build a bridge between the island and the New Jersey shore of the Delaware river to facilitate the transportation of ship building supplies and the export of oil.

New Transport Launched

The transport HENDERSON, the first to be held at the Philadelphia navy yard, was launched June 17. Members of the naval committees of both branches of congress, Admiral Benson, chief of operations of the United States navy, and Major General Barnett, commandant of the United States marine corps, attended the ceremonies.

HENDERSON is 481 feet long, has a 61-foot beam, and 20-foot draft. She is equipped with twin screws, which will give her a speed of 14 knots. Her displacement is 10,000 tons. She will carry 2,000 troops.

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Recent Ship Contracts Go To New Yards

A continued expansion of ship building in American yards is shown by builders' returns to the bureau of navigation, which record the number of steel merchant vessels building or under contract to be built in private plants of the United States on June 1 as 372, with a total aggregate gross tonnage of 1,147,534. This compares with 368 vessels of 1,129,014 gross tons on May 1, and is the highest total reported since the development of the industry by war demand began. The number of vessels completed during May was the largest recently reported, 13, as against six in April, five in March and six in February.

An interesting feature of the statistics is that new ship yards just beginning operations furnished most of the increase during May. None of the large ship building establishments on the Atlantic coast reported new contracts, while one principal yard has announced that, as it is booked to capacity well into 1918, it does not expect to book any more contracts during 1916.

Record of Recent Months

	Built or under contract.	Gr. tons.	New contracts.	Gr. tons.	Vessels completed.	Gr. tons.
	No.		No.		No.	
*	230	901,371	20	61,136	6	31,329
†	244	945,798	107	151,296	5	23,394
‡	360	1,067,856	20	51,011	6	12,916
§	368	1,129,014	20	81,470	13	53,840
¶	372	1,147,534	..	.....	..	.....
	...	.....	167	344,913	30	121,478

*February; †March; ‡April; §May; ¶June. On the first of month.

The largest vessel, for which a contract was awarded during May, was of 7,200 gross tons, the Union Iron Works, San Francisco, reporting two bulk oil steamers ordered of that size. All but five of the vessels contracted for are of more than 5,000 gross tons, three of the five being oil barges of 500 tons each. The new contracts are divided, according to trade, as follows: Cargo carriers, 7; bulk oil carriers, 4; oil barges, 3; river, 1; yacht, 1; not stated, 2. September, 1917, is the latest date at which any of the vessels reported as ordered during May will probably be launched.

The accompanying tables show vessels building or under contract to be built on the first of each month, beginning with February, 1916; new contracts during that month; vessels completed during that month; tonnage building or ordered on May 1, less tonnage completed in May; new tonnage ordered in May; the total for June 1, and details regarding the vessels contracted for during May.

Total Tonnage Building in U. S. Yards

Name—	*Merchant tonnage May 1, 1916, less completions. No.	Tons.	New contracts closed May, 1916. No.	Tons.	Merchant construction June 1, 1916. No.	Tons.
†American Bridge Co., Ambridge, Pa., and Trenton N. J.	112	53,564	2	1,160	114	54,724
American Shipbuilding Co., Cleveland	24	89,200	..	.....	24	89,200
Baltimore Dry Docks & Shipbuilding Co., Baltimore	7	24,500	..	.....	7	24,500
Bath Iron Works, Bath, Me.	4	‡1,600	..	.....	4	‡1,600
Charles Barnes Co., Cincinnati	1	300	1	75	2	375
dChester Shipbuilding Co., Chester, Pa.	11	53,600	..	.....	11	53,600
Clinton Shipbuild'g & Repair Co., Philadelphia	1	560	..	.....	1	560
Cowles Shipyard Co., Buffalo	2	56	..	.....	2	56
Ellicott Machine Corporation, Baltimore	3	750	..	.....	3	750
Fore River Shipbld'g Corp., Quincy, Mass.	13	70,460	..	.....	13	70,460
George Lawley & Sons Corp., Neponset, Mass	..	.....	1	75	1	75
Great Lakes Engineer'g Works, Detroit	16	‡58,940	..	.....	16	‡58,940
Great Lakes Towing Co., Cleveland	2	180	..	.....	2	180
Harlan & Hollingsworth Corporation, Wilmington, Del.	16	69,306	..	.....	16	69,306
Howard Shipyards Co., Jeffersonville, Ind.	6	3,400	..	.....	6	3,400
James Rees & Sons Co., Pittsburgh	2	‡300	..	.....	2	‡300
Manitowoc Shipbuilding & Dry Dock Co., Manitowoc, Wis.	4	1,000	..	.....	4	1,000
Maryland Steel Co., Sparrows Point, Md.	9	53,150	1	5,740	10	58,890
Milwaukee Bridge Co., Milwaukee	1	(e)	..	.....	1	(e)
Merrill-Stevens Co., Jacksonville, Fla.	2	2,200	..	.....	2	2,200
Moore & Scott Shipbuild'g Co., Oakland, Cal.	4	‡16,000	..	.....	4	‡16,000
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.	16	111,947	..	.....	16	111,947
New York Shipbld'g Co., Camden, N. J.	25	131,788	..	.....	25	131,788
Pusey & Jones Co., Wilmington, Del.	7	2,434	..	.....	7	2,434
Quintard Iron Works, New York	1	900	..	.....	1	900
Seattle Cons. & Dry Dock Co., Seattle	7	42,600	..	.....	7	42,600
Skinner & Eddy Corporation, Seattle	..	.....	6	35,720	6	35,720
Spedden Shipbuilding Co., Baltimore	3	730	..	.....	3	730
Standard Shipbuilding Corp., New York	3	14,400	..	.....	3	14,400
Staten Island Shipbuilding Corp., Port Richmond, N. Y.	5	5,241	..	.....	5	5,241
Tampa Foundry & Mch. Co., Tampa, Fla.	1	2,000	..	.....	1	2,000
Tank-Ship Bldg. Corp., Newburgh, N. Y.	..	.....	3	1,500	3	1,500
Toledo Shipbuilding Co., Toledo, O.	11	25,100	..	.....	11	25,100
Union Iron Works, San Francisco, Cal.	21	151,458	2	14,400	23	165,858
Willamette Iron & Steel Works and Northwest Steel Co., Portland, Ore.	..	.....	4	22,800	4	22,800
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia	12	78,400	..	.....	12	78,400
Total	352	f1,066,064	20	81,470	372	f1,147,534

* The following steel vessels were officially numbered and removed from the statement during May: Steamers HENRY G. DALTON, 7,810 gross tons; WINCHESTER, 399 tons; CUBADIST, 5,788 tons; CONNEAUT, 4,749 tons; EDITH J. OSGOOD, 2,483 tons; CITY OF CAMDEN, 730 tons; MUNSOMO, 3,315 tons; MUNPLACE, 3,315 tons. H. H. ROGERS, 10,050 tons; EDGAR L. LUCKENBACH, 8,061 tons; MUNALBRO, 4,385 tons; Mexican steamship COAHUILA, 2,585 tons, also completed; total, 13 vessels of 53,840 gross tons. †Detailed statement not received. ‡Incomplete. dCorrected statement. eNot reported. fIncomplete.

Details of New Contracts

Vessels.	Owner.	Trade.	Gross tonnage.	Speed knots.	Probable date of launch.
Chas. Barnes Co. (not named).	Kensell & Thompson	River	75	6	June 15, 1916.
Geo. Lawley & Sons Corporation; No. 812.	W. Earle Dodge	Yacht	75	16	July 1, 1915.
Maryland Steel Co.; No. 162.	Bethlehem Steel Corp.	Cargo	5,740	11	
Skinner & Eddy Corporation:					
Jennette Skinner.	Not given		5,730	11½	Sept., 1916.
Ethel Eddy	Not given		5,730	11½	Oct., 1916.
No. 3	Stand. Oil Co. of N. J.	Bulk oil	6,400	10½	Dec., 1916.
No. 4	Stand. Oil Co. of N. J.	Bulk oil	6,400	10½	Feb., 1917.
No. 5	Builders' account	Cargo	5,730	11½	July, 1917.
No. 6	Builders' account	Cargo	5,730	11½	Aug., 1917.
Tank-Ship Building Corporation:					
No. 1	Tampico Navigat'n Co.	Oil barge	500	..	Aug., 1916.
No. 2	Tampico Navigat'n Co.	Oil barge	500	..	Aug., 1916.
No. 3	Tampico Navigat'n Co.	Oil barge	500	..	Sept., 1916.
Union Iron Works:					
No. 145	Pan-A'm Petroleum & Transport Co.	Bulk oil	7,200	11	Aug., 1917.
No. 146	Ditto	Bulk oil	7,200	11	Sept., 1917.
Willamette Iron & St'l Works and Northwest Steel Co.:					
Lauritz Kloster	Lauritz Kloster	Cargo	5,700	10½	Jan. 1, 1917.
Ellen Kloster	Lauritz Kloster	Cargo	5,700	10½	March 1, 1917
Peder Kleppe	Peder Kleppe	Cargo	5,700	10½	June 1, 1917
Willey Gilbert	Willey Gilbert	Cargo	5,700	10½	Sept. 1, 1917.

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Unloading World's Hugest Freighter

Italian-Built Steamer Milazzo Has Unusual Equipment for Discharging Cargo—Employs Cars and Elevators to Clear Hold

By E. C. Kreutzberg

MILAZZO, a freighter of a new type, arrived in New York harbor July 1 on her maiden voyage. This vessel not only is said to be the largest ship in the world for freight alone, but she is fitted with unique equipment for rapidly unloading coal and grain, which she was specially designed to carry. She arrived in New York in ballast and is now loading at the foot of Thirty-fourth street, North river, with a general cargo, since, under present conditions, it is much more profitable to carry a cargo of this character than to take on coal or grain. This vessel is owned by the Navigazione Generale Italiana and was laid down in July, 1914, at the Fiat San Giorgio ship yards at Muggiano, near Genoa and close to the Italian naval base at Spezzia. She was launched May 14, 1916, and is to be followed by VOLTURNO, a sister ship which will be launched shortly.

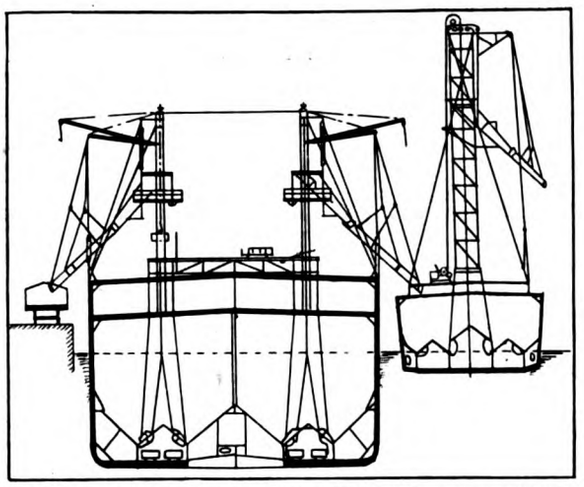

FIG. 1—CROSS SECTION SHOWING CONSTRUCTION OF MILAZZO'S HOLDS AND ELEVATOR SHAFTS. THIS FIGURE ALSO SHOWS THE METHODS OF DISCHARGING TO LIGHTERS AND TO THE SHORE AND SHOWS HOW BOOMS ARE SWUNG FROM THE ELEVATOR MASTS FOR HANDLING GENERAL CARGOES

MILAZZO is designed along lines which differ radically from those usually characteristic of freighters. The cargo hold of the ship is floored with steel plates which slope away from or toward the sides of the vessel. Thus the cross section of the hull, Fig. 1, shows that the cargo floor between the center of the ship and each side, takes the form of the letter "W". Underneath each "W" are longitudinal tunnels, each of which is double-tracked. On these tracks are placed small cars which are spotted, by hand, underneath small gate hoppers through which coal or grain may be discharged from the cargo hold as rapidly as required. The cars are then pushed along the tracks to the bottom of a shaft containing cable elevators. The cables are attached to the cars and the latter lifted to the deck where they are dumped into chutes which discharge from the vessel. The shafts in which the elevators operate are divided below the deck into two branches, which command the two tracks in each tunnel. These shafts are of steel plate construction and are surmounted by tubular steel masts which are fitted with guides, and with triggers which automatically upset and discharge the cars as they are elevated to the proper level. The masts are provided with platforms to which the chutes are fixed. Each chute can be inclined at any desired angle, and it can be brought to any desired height above the deck by raising or lowering the steel masts. The ends of the chutes are hinged in order that they may be swung back to provide deck room when they are not being used. This system is the invention of Capt. Cavalieri Emilio Menada. Elevators of the Menada type previously have been installed on lighters in Italian harbors, and in the ports of Buenos Aires, Rio Janeiro and Dakar. MILAZZO is the first freighter to be equipped with them. The elevators on MILAZZO are 22 in number, 11 on each side of the vessel, and are provided with four cars each; the cars may be transferred from one tunnel to another by means of tracks on the deck which connect the elevator hatches. It is claimed that the slanting construction of the bottom of the hold is a great advantage in that it not only permits cargoes of bulk material to stow themselves when taken on but it prevents them from shifting during the voyage. The elevator system is said to be capable of unloading an entire cargo of 14,000 tons within 48 hours. The elevators are operated by steam winches and these also raise and lower the steel masts to the required height. For loading general cargoes, the steel masts are provided with booms which may be swung up to project over the side.

MILAZZO is commanded by Captain Cavalieri Simone Guli, formerly commander of VERONA. MILAZZO is 512 feet long, 65.8 feet wide and has a molded depth of 33.5 feet. Her displacement, when loaded, is 20,040 tons. Her gross tonnage is 11,477 tons, her net tonnage, 7,537 tons and she carries 1,500 tons of coal in her bunkers. She is equipped with a quadruple expansion engine with capacity of 4,000 horsepower. She has a single screw and is capable of making 11 knots an hour.

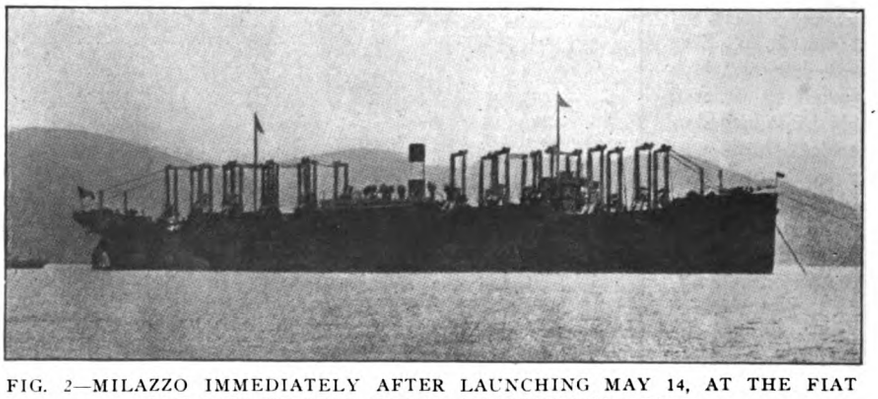

FIG. 2—MILAZZO IMMEDIATELY AFTER LAUNCHING MAY 14, AT THE FIAT SAN GIORGIO SHIP YARDS AT MUGGIANO, ITALY

Fiscal measures are under consideration by the Greek government which will include a tax of 20 per cent on half the price of the merchantmen which are sold during the present European war.

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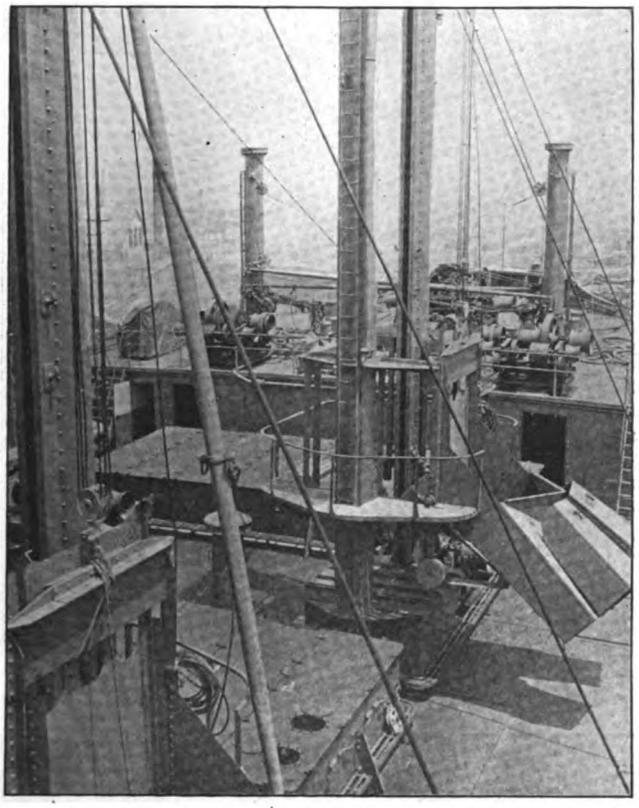

FIG. 3—LOOKING FORWARD FROM MILAZZO'S BRIDGE, SHOWING ELEVATOR MASTS AND UNLOADING HOPPER

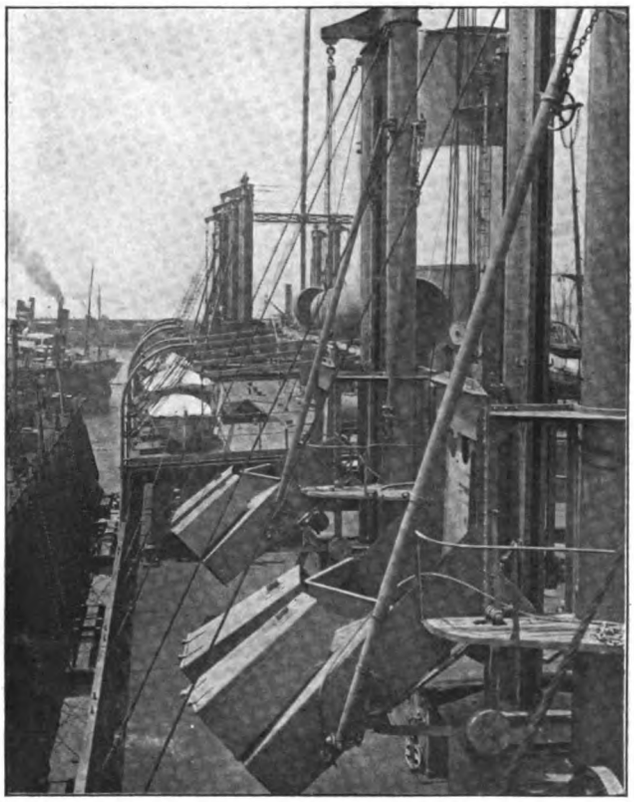

FIG. 4—LOOKING AFT FROM BRIDGE, SHOWING HOPPERS FOLDED BACK

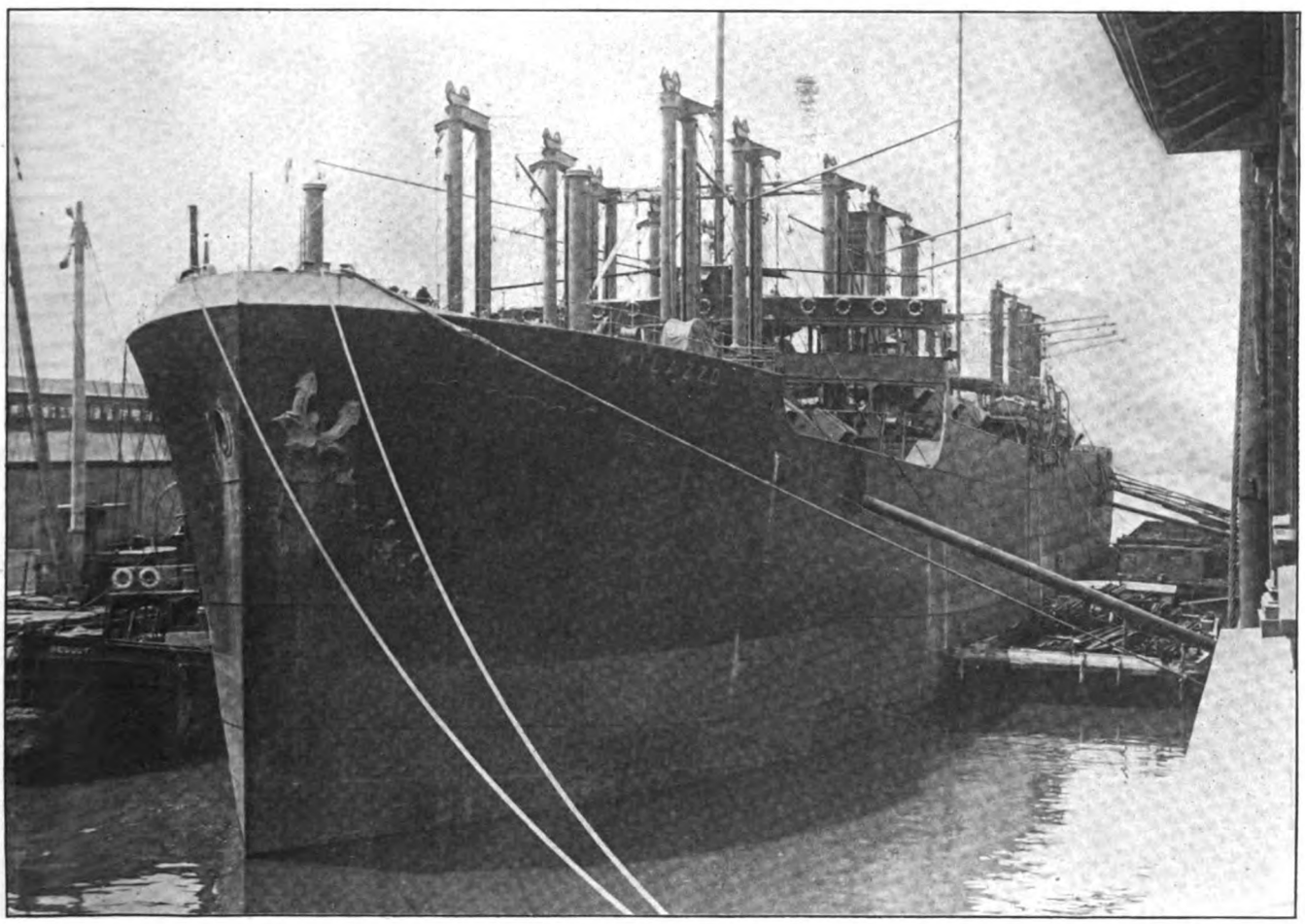

FIG. 5—MILAZZO IN HER BERTH AT PIER 74, NORTH RIVER, NEW YORK

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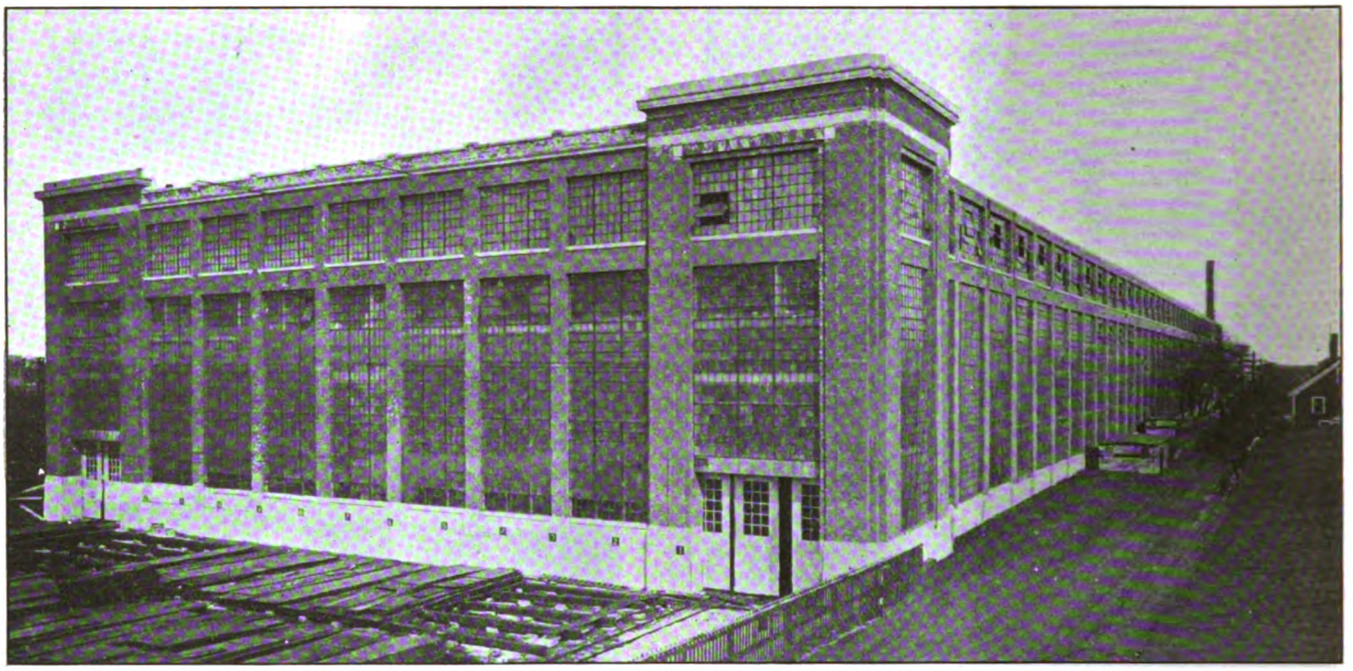


NEW SHIP TOOL SHOP JUST COMPLETED BY FORE RIVER SHIP BUILDING CORPORATION, QUINCY, MASS.

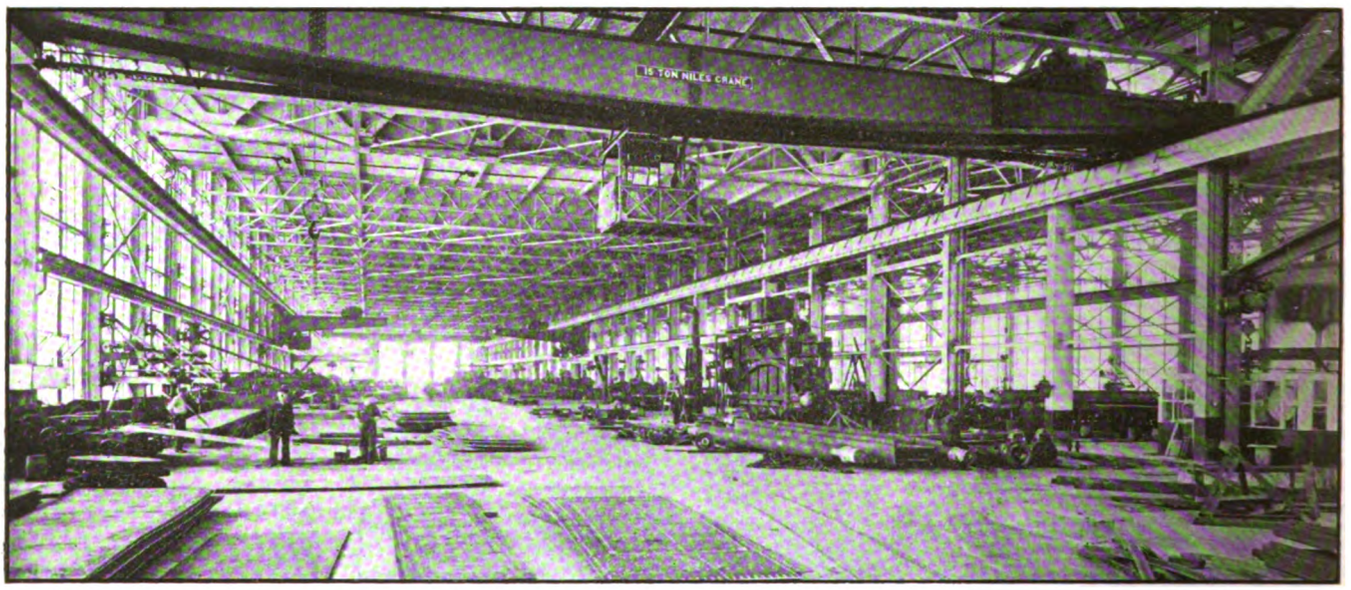
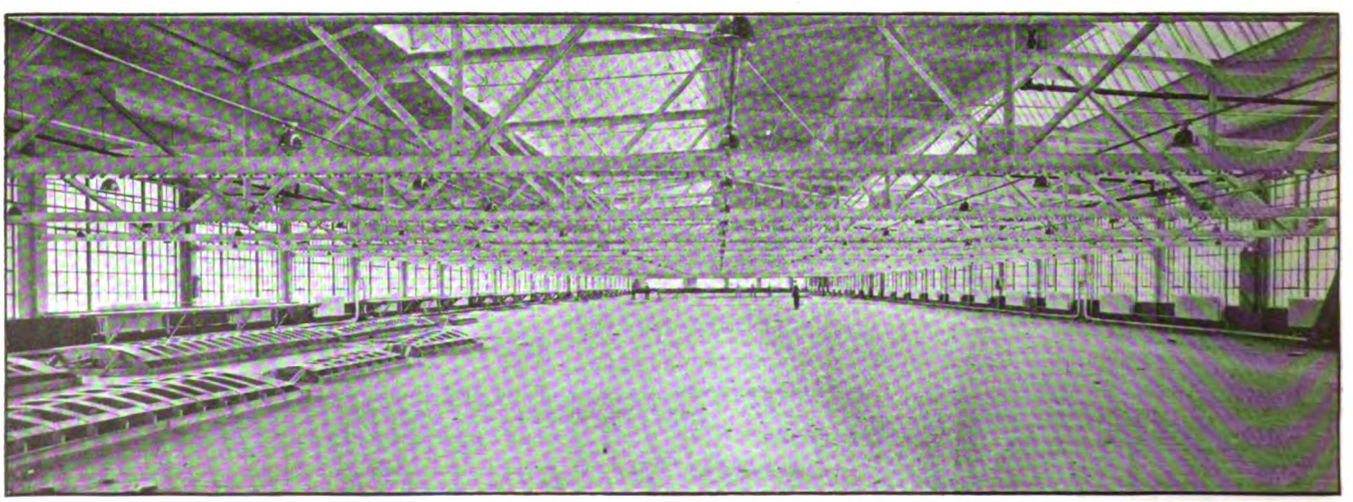


PLATE SIDE OF NEW SHIP TOOL SHOP LOOKING WEST



MOLD LOFT ON SECOND FLOOR OF NEW SHIP TOOL SHOP LOOKING WEST

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Large Ship Building Shop at Quincy

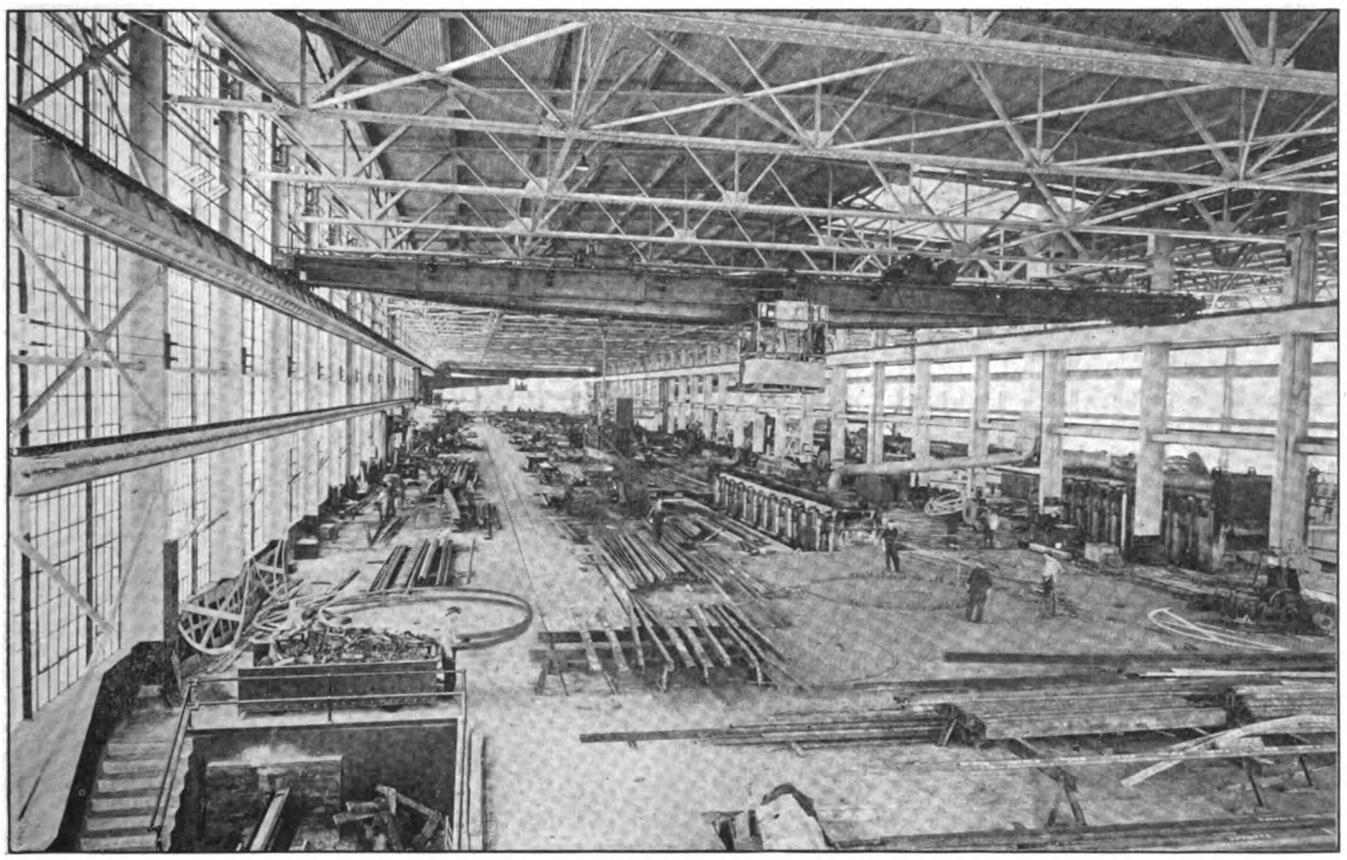
The New Ship Plate and Angle Shop of the Fore River Ship Building Corporation Covers More Than Three Acres—The Equipment is Complete and Modern

THE Fore River Ship Building Corporation, Quincy, Mass., has completed what is said to be the largest ship plate and angle shop in the world. The structure stands close to the slips for the big ships and is visible for miles. The space enclosed is so vast that the clamor of the machinery is subdued. The building, which is known as the ship tool shop, is 188 x 769 feet. It is 60 feet high and covers an area of 3¼ acres. It is floored with concrete and rock asphalt. The building is constructed of red brick with a steel frame; a maximum portion of the wall area is comprised of reflector glass, the center of the building thus being as well-lighted as any other portion. The building lies east and west and is served by a large stock material yard lying north and south at the western end. At the east end of the ship tool shop are located the building slip cranes, which run north and south. The building is divided by a row of columns, running east and west. The north portion is devoted to angles and beams, and the south side to plates. The material yard receives all the raw material for hull construction and is provided with railroad tracks and gantry cranes. This material is conveyed to the shops by electric storage trucks which may go through the shop from end to end and also under the building slip cranes at the east end.

Latest Equipment

The ship tool shop is fitted with machinery of the latest type. The plate portion of the shop is equipped with punches with roller tables, a furnace, bending blocks, plate planers, large rolls, hydraulic plate-bending and punching machines, scarfing machines, counter-sinking machines, and similar tools. It is served by 15-ton overhead cranes and by wall, jib and post cranes. The angle side of the shop is fitted with with a furnace, bending blocks, punches, planers and a hydraulic joggling press. This side is served also by overhead, wall, jib and post cranes. All machines in the shop are provided with independent electric drive and all are controled from a switchboard room. The building also is provided with hydraulic pumps and accumulators. The east end of the shop, which is equipped extensively with pneumatic riveters, is given over to the assembling and riveting of bulkheads and heavy material which are carried out to the building slip cranes which transfer them to their destination.

The second floor of the building, which is reached by elevators at each end, contains a mold loft and a sheet-metal working shop. The mold loft is 93 x 605 feet, with a storage ell, containing 4,000 square feet. The loft is utilized for laying down ships to full size in order that templates may be made. The sheet-metal working shop is 93 x 164 feet, with a 41 x 93-foot ell. This is served by electric monorail hoists and is equipped with sheet-metal working machinery of the latest type. Under the second floor, at each end of the building, are offices, which are sustained by the floor trusses. The building also includes wash rooms, locker rooms and shower baths for the workmen.



ANGLE AND BEAM PORTION OF NEW SHIP TOOL SHOP LOOKING EAST

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Ship Cut Apart With Oxy-Acetylene Torch

A SURGICAL operation, remarkable not only for the engineering methods involved, but for the speed with which it was brought to a successful conclusion, was performed on May 27 at the plant of the Robins Dry Dock & Repair Co., Erie Basin, Brooklyn. On that date, the steamer L. V. STODDARD was cut in two, preparatory to adding 52 feet to her length, and converting her from a general freighter into a modern oil tanker. The steamer was cut amidships by burning out the rivets with oxy-acetylene torches; this operation required only 26 hours. The forward section was then advanced the 52 feet in 11 minutes, and the vessel was rebuilt and floated within 12 days. The first operation, after putting the ship in dock, was to separate all pipe lines, electric wiring, steering gear, etc., after which the rivets were attacked with the oxy-acetylene flame. This method now is used exclusively at the Robins yard for removing rivets. The forward section was then separated from the after section by hydraulic pumps, after which the forward section was pulled to its marks by means of steam winches, the distance being gaged with great care, in order to insure correct measurements in rebuilding. The cradle was next flooded with water in order to locate the ship fair on the blocks and on an even keel.

L. V. STODDARD had a length of 246.7 feet and 43.8 foot beam. Her capacity was 2,306 tons. She was built at Toledo, O., in 1913, for the Boston Virginia Transportation Co., and immediately taken to the Atlantic; since that time her hailing port has been New York. She plied between Norfolk and Boston in the coal trade for some time, and also was in the sugar trade between the West Indies and Cuba to points south of Hatteras. Since the war broke out she has made several trips to European and Mediterranean ports. The addition of 52 feet will add at least 1,000 tons to her capacity. Two sister ships will be cut apart and rebuilt. The work is directly in charge of W. H. Todd, president of the Robins company, while his assistants on this job are George J. Robinson, vice president of the company, and Anthony McGarvey, superintendent.

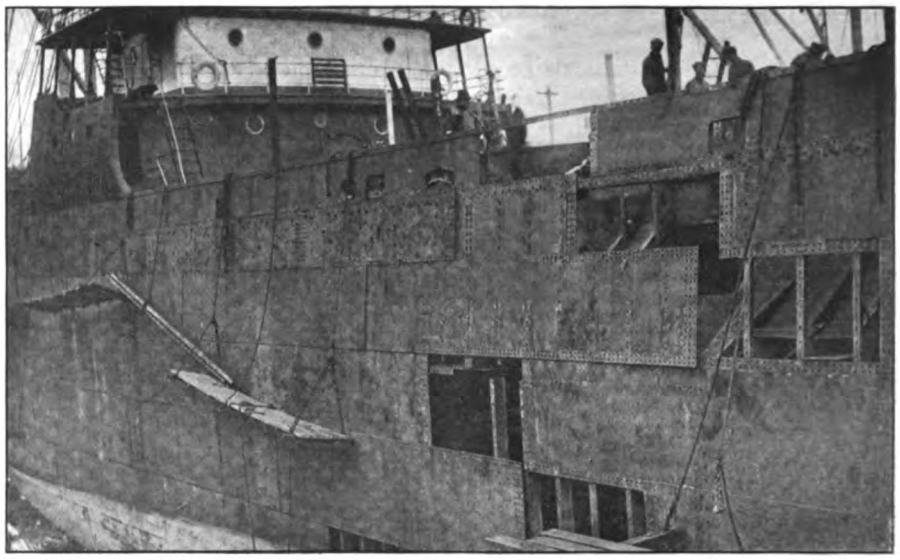

FIG. 2—VIEW OF VESSEL AFTER SEPARATING FORWARD AND AFTER SECTIONS BY MEANS OF HYDRAULIC PUMPS

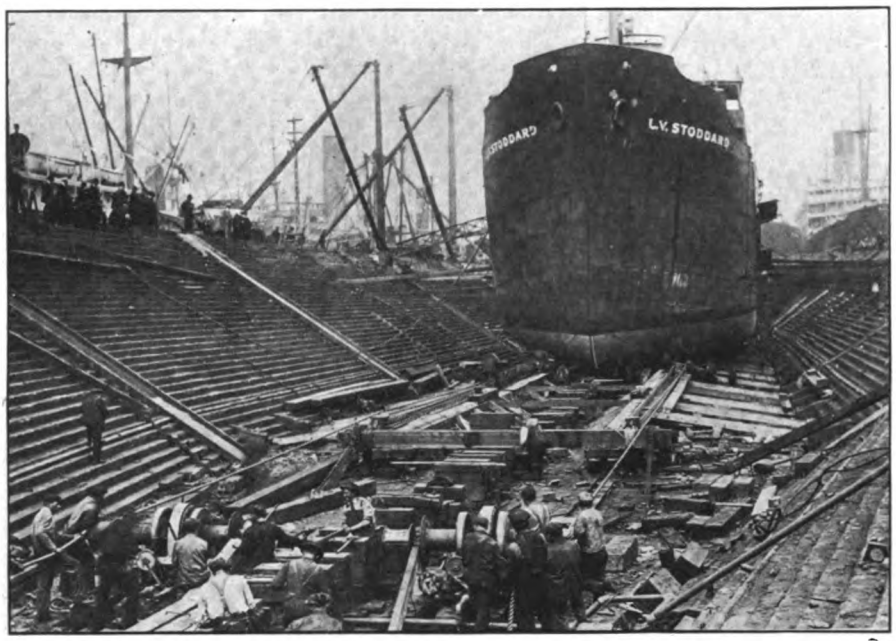

FIG. 1—MOVING FORWARD PORTION OF L. V. STODDARD TO THE 52-FOOT MARK BY MEANS OF STEAM WINCHES

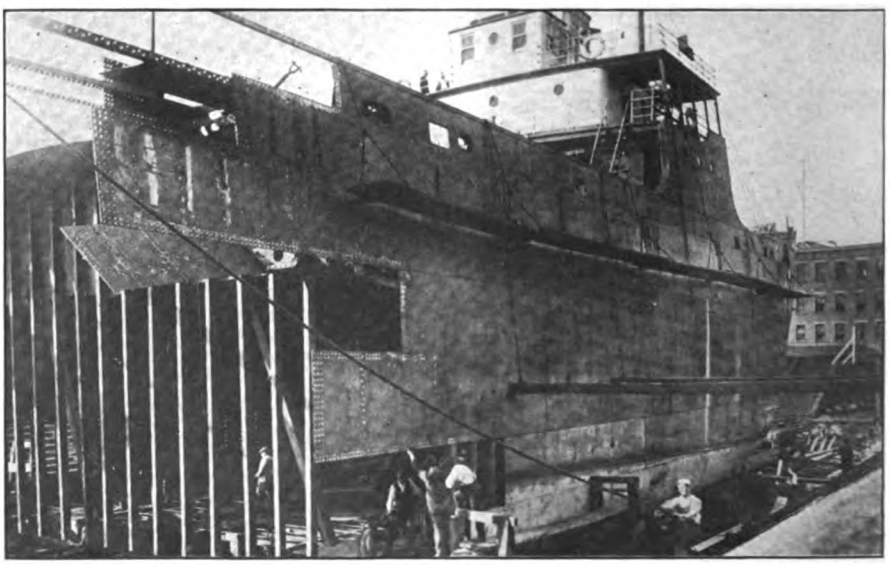

FIG. 3—CROSS SECTION OF FORWARD END AFTER REMOVAL TO 52-FOOT MARK AND PLACING IT FAIR ON THE WAYS

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On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Up and Down the Great Lakes

By A. A. Eiben

THE new steamer E. L. FORD, building at the Lorain yard of the American Ship Building Co. for the Franklin Steamship Co., H. K. Oakes, Cleveland, manager, will be brought out by Captain D. C. Sullivan. Thomas W. Braund will be her chief engineer. FORD is a 12,000-ton freighter. She will be launched July 15, and will go into commission during the latter part of August.

* * *

The new steamer D. G. KERR, of the Pittsburgh Steamship Co.'s fleet, left the Lorain yard of the American Ship Building Co. on June 29 on her maiden trip.

* * *

M. A. Hanna & Co. recently closed a contract with the American Ship Building Co. for two 10,000-ton steamers, to come out during the summer of 1917. The vessels will be duplicates, 545 feet over all, 525 feet keel, 58 feet beam and 31 feet deep. This contract makes five steamers which M. A. Hanna & Co. have ordered for delivery in 1916 and 1917. Four of the vessels will be built by the American Ship Building Co., and one, a 12,000-ton freighter, by the Great Lakes Engineering Works, Detroit. Only one of the freighters will go into commission during the present season.

* * *

The hull of the steamer MAJESTIC, of the Northern Navigation Co.'s fleet, which burned to the water's edge and then sank in shallow water in Sarnia bay last fall, has been raised by the Reid Wrecking Co. It is probable that the hull may be rebuilt.

* * *

Divers who have examined the hull of the wrecked steamer CHARLES S. PRICE, sunk in the lower end of Lake Huron in the storm of November, 1913, report that no bodies were found in the vessel. The entire crew of PRICE, numbering 28 men, was lost when the vessel foundered. The wreck of PRICE is being moved as rapidly as weather conditions permit, to shallow water on the Michigan shore line between Lexington and the coast guard station.

* * *

Walter H. Oades, who has been identified with the ship building industry on the Great Lakes for more than half a century, died at his home in Detroit on July 8. Mr. Oades had retired from active business about a year ago.

* * *

Captain Julian Porter, retired vessel master and harbor master of Lorain, O., died recently. Captain Porter was born in Lorain in 1846 and had sailed on the Great Lakes since his boyhood.

* * *

Alexander Hynd, consulting engineer and naval architect, Cleveland, has been appointed marine superintendent of the Gaston - Williams - Wigmore Steamship Corporation, of New York, with offices in New York City.

* * *

The passenger steamer UNITED STATES, belonging to the Indiana Transportation Co.'s fleet, Chicago, was sold recently to the Crosby Transportation Co., Milwaukee.

* * *

The barge MINGO was recently purchased by the Pringle Barge Line Co., Cleveland, from L. P. Graves, Buffalo. The barge CONNELLY BROS., owned by Charles S. Neff, Milwaukee, and the barge BALTIC, of the Pringle line, have been sold to coast interests.

* * *

The working force in the steamboat inspection service on the Great Lakes has been greatly augmented during the past month. Twelve assistant inspectors have been appointed, four for the Cleveland district, four at Buffalo, two at Detroit and two at Grand Haven, Mich. Captain William H. Stern, Cleveland, and Captain Frank G. McCarty, Mackinac Island, Mich., have been appointed assistant inspectors of hulls at Cleveland, and A. C. Brockner and Everett D. Butler, Cleveland, have been selected as assistant inspectors of boilers at this port. The addition of these four assistant inspectors gives Cleveland a total of nine employes in the steamboat inspection service, comprising one supervising inspector, two local inspectors and six assistant inspectors. Captain John A. Connelly, master of the steamer ROBERT WALLACE, and Captain Iver Rolseng, formerly master of the steamer ST. PAUL, have been appointed assistant inspectors of hulls at Buffalo. John W. Mark has been appointed assistant inspector of boilers at that port; another assistant boiler inspector will be named shortly. At Detroit, Captain John H. McDonald, Marine City, has been appointed assistant inspector of hulls, and W. H. Dungan, assistant inspector of boilers. At Grand Haven, Mich., the new appointments include Captain D. T. Sullivan, assistant inspector of hulls, and Abraham Auld, Milwaukee, assistant inspector of boilers.

On the Chesapeake

By Hollis F. Bennett

BALTIMORE'S waterfront suffered a serious loss this month in the burning of the Northern Central Railway Co.'s Elevator No. 3 at Lower Canton. The fire, which started in the top of the storage bins, was followed by an explosion, which blew out the northwest corner of the building. In a few minutes the entire elevator, which was one of the largest in this vicinity, was enveloped in a mass of flames. The Dutch steamship WILHELM VAN DRIEL SR., and the British steamship WELBECK HALL were loading at the elevator and the schooner SINGLETON PALMER was unloading manganese ore at the pier adjacent. Tugs got WELBECK HALL clear after considerable damage had been done, but WILHELM VAN DRIEL SR., moored to the elevator wharf with wire hawsers, could not be moved, and in a short time the west wall fell on her, completely covering her decks. SINGLETON PALMER was hauled to the head of the dock and had water continually played on her by the fire department. The damage was slight. The loss of the elevator and contents will approximate $1,200,000. The damage to the two ships is estimated at $750,000. The Pennsylvania railroad, which controls the elevator, announced that the elevator would be immediately replaced with a concrete elevator of the latest design. The burning of the elevator caused a congestion of grain shipments at this port, but, by transferring grain to other elevators, it has been greatly relieved.

* * *

The Dutch steamship SAMARINDA, which collided with the American steamship BRANDON, is in the upper dock of the Baltimore Dry Docks & Ship Building Co. for repairs.

* * *

The side wheel steamer WAKEFIELD, of the Chesapeake & Potomac Steamboat line, struck a submerged obstruction in the Potomac river at Mathis Point and sank June 16. Her crew and 60 passengers were taken off by the steamers MAJESTIC and GRATITUDE. WAKEFIELD will be immediately raised and repaired.

* * *

The Norwegian bark APOLLO, arriving June 15, won a long race from the American schooner RUTH E. MURRELL. Both loaded cargoes of manganese ore

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at Rio de Janeiro and both were towed out by the same tug. RUTH E. MURRELL was reported at Cape Henry June 19 with loss of sails.

* * *

The Riter-Conley Co., Pittsburgh, a subsidiary of the McClintic Marshall Construction Co., one of the largest structural steel fabricators in the United States, has leased the ship yard of the Ellicott Machine Corporation, located at Fairfield on the south branch of the Patapsco river, just across from Baltimore. It is understood that the Riter-Conley Co. will start to construct several steel, oil and cargo carrying barges at Fairfield. The plant contains about 16 acres and 700 feet of waterfront. This lease does not cover the machine shops of the Ellicott company at the foot of Bush street, Baltimore.

* * *

The death of Captain Frederick William Hamilton Murrell recently brings to a close one of the most interesting chapters in the annals of the merchant marine. Captain Murrell first gained prominence in 1889 as captain of MISSOURI, when he effected the transfer of 733 passengers in a heavy sea from the sinking DANMARK, a Danish boat bound for New York. To make room, he jettisoned the greater part of his cargo. Captain Murrell ran for the Azores and landed 363 of the rescued in St. Michaels and brought the remainder to this country. At the time of the rescue, Captain Murrell was but 27 years of age and was the youngest captain in the employ of the Atlantic Transport line. Following his return to England, Captain Murrell was decorated by the King of Denmark, Prince Bismark, the King of Sweden and the King of Rumania. Captain Murrell was born in 1862 at Colchester, Essex, England. During his association with the Atlantic Transport line he commanded the steamships SURREY, MISSOURI, SWANSEA, MARYLAND, MAINE and MISSISSIPPI.

Puget Tonnage Scarce

By F. K. Haskell

THE charter market on the Pacific coast is very slack. The main reason for this inactivity is the scarcity of tonnage. The vessels available for freighting lumber from the coast are much in demand and are as difficult to obtain as heretofore, with the result that lumber freights are firm and the market for lumber carriers steady. Everything afloat that will carry lumber is under charter for at least two or three off-shore voyages in advance. Many relics of ancient marine days on this coast have been brought from oblivion and pressed into the lumber trade again. All these old boats have found business without difficulty. Among the charters announced during the past week was that of the brig HARRIET G., 88 net tons. She is of a type now almost obsolete on the Pacific. She was built at Norfolk, Va., in 1878, and for the past three years has been idle. Her last service was in the Alaska fishing trade. She is being repaired preparatory to loading a full cargo of lumber at Bellingham, Wash., for Callao, Peru. HARRIET G. is only 130 feet in length and can carry less than 300,000 feet, but the freight to be received is $30 per thousand. Other charters show an American schooner taken for Australia at private terms, and another carrier fixed for Shanghai at $30 per 1,000 feet.

The lumber market, however, has been quiet in off-shore chartering. Off-shore freights remained firm, but unchanged from last month, and there seems to be no tendency towards a break. The coastwise charter market is very firm, recent figures showing that 50 cents above the asking rate has been paid for two prompt steamers, Grays Harbor to San Pedro. The rate from Puget Sound and Grays Harbor to San Francisco remains at $5.50 and $6.50 to southern California. Other features of the coast charter market during the month have been the charter of three Japanese steamers at private terms to load general cargo on Puget Sound for Vladivostok, and two Japanese tramps to carry general freight from San Francisco to Japanese ports. All this business has been done at private terms. Two smaller steamers have been taken from San Francisco to Japan and Manila at $20 and $18, respectively. A sailing ship has been engaged to carry case oil from San Francisco to Australia, private terms, this being a very unusual fixture. The increasing number of Japanese steamers in trade out of Sound ports is noticeable.

* * *

Although overlooked in the adjustment of the wage scale between the longshoremen and the dock owners, the transcontinental railways have not acceded to the increased terminal charges for handling freight consigned to the orient and Alaska, and railroad officials are holding conferences for the purpose of placing a maximum on what they will absorb. Freight traffic men declare that the practice of the land carriers of absorbing these charges has been permitted by neglect to develop a situation that makes the haul unprofitable. There are many difficult angles to the problem, and no settled plan has yet been devised for meeting them. Where a terminal line is compelled to employ a competitive carrier to switch a car, the originating line must pay a charge of 40 cents per ton. As far as the situation has been outlined, the railways will consider the publication of the maximum handling charges they will absorb, and put the balance up to the vessel. Should the vessel owners refuse, the situation will be further complicated. All Pacific coast ports are working under similar conditions, except Vancouver, B. C.

* * *

Export and import agents of Seattle and Tacoma, who have powerful connections at Vladivostok, have been looking around Vancouver for quarters and dock facilities. In traffic circles it has been reported that the British government may declare an open shop policy and enforce the order, thereby taking advantage of the closed conditions on Puget Sound. Should such action be taken, the deep sea vessels, it is believed, would change their calling place to the British Columbia port.

* * *

The new cannery tender DIEHLESS recently ran from Astoria to Portland in 12 hours and burned less than four gallons of oil an hour. The new boat is equipped with a 45-horsepower semi-diesel engine. She was built at Astoria for the Columbia River Packers' Association.

Along Columbia River

By Kenneth McAlpine

THE two principal developments around Columbia river points recently have been the waterfront strike and the loss of the San Francisco & Portland Steamship Co.'s passenger steamer BEAR, sister ship of BEAVER.

BEAR went ashore, in a dense fog, off the northern Californian coast at a point just north of Sugar Loaf Rock, which forms the outer end of Cape Mendocino. She is probably a total loss, as one attempt to salvage her by the steamer IAQUA, of San Francisco, was unsuccessful. A bad storm later piled the vessel higher up on the beach. A dredge is now attempting to dig a channel around her, which will permit another trial to salvage her. BEAR was a vessel of 5,000 tons, 380 feet long, 47-foot beam and 26-foot molded depth.

* * *

The waterfront strike was called June 1, the river steamboat men and longshoremen going out together. A week later, most of the firms had reached an agreement with the longshoremen and were able to get their vessels loaded. The failure of a general agreement caused another mix-up, as firms which were able to get their vessels loaded could not get them unloaded at the other end. A score of mills have necessarily shut down, forcing the logging camps to discontinue operations. Boats are not running freely, passenger boats operating irregularly and carrying little or no freight. The river boats have been running on schedule under police protection. During the last walkout, the Portland Chamber of Commerce put itself on record against the closed shop.

* * *

Exportations of wheat were larger in May of this year than last by nearly 300,000 bushels. Shipments are far behind those of the corresponding 11-month period ending May, 1915, the decline this year being nearly 1,000,000 bushels. Only one more cereal ship is expected here this year, she being the British steamer BARATIC, now on her way to San Francisco from Calcutta, bringing a load of gunnies. BARATIC will load here for England.

* * *

One shipment from the Columbia this month was 5,000 feet of clear spruce lumber, which went to Philadelphia for use as sounding boards for pianos. A large quantity of this lumber has been shipped to the eastern market and regular shipments will be continued.

* * *

The cruiser MARBLEHEAD has just been assigned to the Oregon naval

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militia in place of the old cruiser BOSTON, which will be sold at auction in the near future.

* * *

The first shipment of steel for the boats to be built by the Northwest Steel Co. for Hannevig and Johnson, New York, has arrived. Work will be started at once. These ships are being built for Norwegian interests.

* * *

Captain Rees, formerly in command of PORTLAND, will no longer be seen on the bridge of that vessel, as she has been sold to French interests by her former owner, the Globe Milling & Grain Co. Delivery will be made at Lapallice, France. PORTLAND was not constructed for the coast trade, having been brought out from the Great Lakes about three years ago, when the Globe interests built a chain of grain elevators along the Pacific coast. She had been operated on the Great Lakes since 1900 and was called A. B. WOLVIN.

* * *

Captain J. Meany has been promoted to inspector of hulls for the mid-Pacific district, with headquarters at Honolulu.

* * *

The McEachren ship yards at Astoria have been incorporated at $500,000. Plans call for a large drydock and steel ship yard.

Boston Bay Doings

By George S. Hudson

THE labor situation along the Boston waterfront appears to be clearing after an epidemic of strikes that delayed movements of shipping. As many as five strikes were noted in one day and, almost without exception, the longshoremen were granted increases of at least 10 cents an hour for straight day work. The scale now in force on the transatlantic terminals is about as follows: day work, 35 cents an hour; overtime, 50 cents; Sundays and holidays, 60 cents. This scale is without precedent in this part of the country and representatives of the lines probably acceded to demands rather than face a strike of indefinite duration that might tie up tonnage in face of big offerings of merchandise and correspondingly high rates. Question arises what will happen when rates become normal and the volume of merchandise falls off. Then naturally, the companies may not feel in position to continue the scale in view of dropping receipts.

* * *

The three-masted schooner CATHERINE, in charge of H. R. Amory as supercargo of the Western Islands Trading Co., has sailed from Boston for Lisbon with a cargo of gasoline and kerosene. Mr. Amory, it will be recalled, last summer made a voyage to the West Coast of Africa by way of the Western Islands in the 40-foot schooner KITTIE A. in interest of Harvard college.

* * *

A. M. Beers is manager of the proposed steamer line between Boston and New York in competition with the Eastern Steamship Corporation. Mr. Beers has offices in the Boston chamber of commerce and is in the market for steamers that will accommodate about 1,000 passengers and stow 1,000 tons of freight. The company has options on two such vessels owned on the Hudson river. Negotiations for a toll rate through Cape Cod canal are in progress as the short cut will often avoid rough water off Cape Cod. The company announces that it will cut rates on passengers and freight.

* * *

The British steamship EVANGELINE, regularly on the Boston-Halifax run and last winter chartered for the route between New York and Bermuda, has arrived at Manchester, Eng., from Boston with a 2,300-ton cargo on a $50,000 charter. The ship is commanded by Capt. Hawes and, returning, will be returned to the Halifax trade.

* * *

In command of Capt. C. M. Hoie the former Boston steam yacht PEREGRINE has sailed from Boston for Iceland to engage in the herring fishery with market in Norway. The yacht was altered for the new trade by Bertlesen & Petersen, of Boston.

* * *

The R. T. Green Co., of Chelsea, Mass., is building a four-masted schooner of about 1,100 tons gross register. This company has rebuilt at a cost of about $45,000 the four-masted schooner PRISCILLA L. RAY, burned to the water's edge a few months ago and stricken from the register as a total loss.

* * *

The tug W. S. TAYLOR, recently purchased from the Lakes by Capt. Theodore Krum, of Boston, has arrived at that port after an 18-day passage by way of the St. Lawrence river. TAYLOR is 126 feet long and will be employed in general coastwise towing.

* * *

The side-wheel steamboat GEN. LINCOLN has been sold by the Boston, Nahant & Pines Steamboat Co. to the Glen Line of New York. The twin-screw steamer NASSAU has been chartered from the Long Island Railroad to take place of GEN. LINCOLN.

* * *

After having been given up for lost, the three-masted schooner LUCIA PORTER has been floated from a beach near Boston and is now undergoing repairs at a Boston yard. Most of the vessel's cargo of laths, from Nova Scotia, was salved.

The steam yacht WINCHESTER designed by Cox & Stevens, naval architects, for Peter Winchester Rouss, of the New York Yacht Club, was successfully launched recently at the yard of the Bath Iron Works, Bath, Me. The launching party consisted of Mr. and Mrs. Rouss, their two daughters, Margaret and Helen, and Mr. and Mrs. Irving Cox. The yacht was christened by Miss Rouss, who successfully broke a bottle of champagne on the vessel's bow as she started down the ways. WINCHESTER is a 30-knot turbine express yacht, 225 feet in length.

Growth of U. S. Marine

Additions to the American merchant marine during the second year of the European war were not as great as additions made during the first year of the war, according to a tabulation of the shipping industry just issued by the department of commerce. This is doubtless due to the fact that many American-built-and-owned vessels, and many foreign-built and American-owned ships were transferred to American registry immediately after the outbreak of the European war and after the so-called emergency ship registry act was passed. During the 11 months of the present year, that is up to June 1, a total of 907 American-built ships, representing 289,965 gross tons, were added to the American merchant marine. The greater number, 139 vessels, were added in July, 1915, the greater amount of American-built tonnage, however, being added in May last. During May there were added to the American merchant marine 114 American-built ships, representing 61,881 gross tons, the largest amount of American tonnage registered during any month since the outbreak of the war in Europe.

The greatest amount of foreign-built tonnage was added to the American merchant fleet in September, 1914, soon after the passage of the emergency ship registry act. During that month a total of 35 vessels representing 131,180 gross tons, of foreign construction, were added to the American marine. The foreign-built vessels added during the past 11 months totaled but 34 vessels, representing but 80,468 gross tons. These figures prove how dependent the growth of the American merchant marine during the past year has been upon the capacity of domestic ship yards.

Following is the tabulation as issued by the department:—

	1914-15. Building U. S.		Foreign built	
Month—	No.	Gr. tons.	No.	Gr. tons.
July	120	17,849	..	.....
August	80	21,477	2	10,648
September .	83	17,184	35	131,180
October ...	100	21,724	30	99,030
November ..	71	14,564	10	31,221
December ..	62	15,103	16	59,795
January	32	12,258	20	86,401
February ...	55	8,629	8	27,008
March	111	24,538	6	15,123
April	111	24,538	6	15,123
May	173	19,494	9	27,743
June	176	16,767	3	10,550
Total 1,226		215,711	145	520,212
	1915-16			
July	139	16,565	2	2,910
August	94	15,410	4	12,599
September ..	83	14,301	5	11,776
October ...	88	17,368	8	19,467
November ..	70	23,841	3	6,322
December ..	32	20,307	..	.....
January	48	26,408	1	707
February ...	44	32,562	3	7,096
March	81	35,494	1	1,388
April	114	25,828	..	.....
May	114	61,881	7	18,203
Total	907	289,965	34	80,468

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Equipment Used Afloat and Ashore

New Flexible Coupling—Marine Brushes

THE Clark Flexible Coupling Co., 27 Walker street, New York, has placed on the market an interesting coupling suitable for joining shafts that are not perfectly aligned. It consists of two sprocket cut flanges held flexibly together by a roller chain, which allows automatic adjustment to all positions within the range of the device. This form of coupling is said to give a maximum flexibility in all directions. The rollers of the chain are always in contact with all of the sprocket teeth, insuring an equal distribution of the load with a minimum of wear. The teeth are provided with clearance, so that in case of end motion they do not conflict with each other or with the chain. As indicated in the accompanying illustrations, each chain is securely held in place by a master link. When desired, this link may be removed, thus permitting the shafts to run independently in either

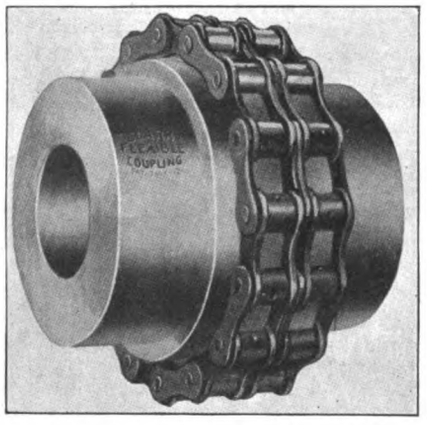


FIG. 1—DOUBLE CHAIN TYPE FLEXIBLE COUPLING

direction. These couplings are suitable for use on shipboard in connection with the operation of electric generators and other auxiliary machinery.

To Make Propellers

The American Manganese Bronze Co., Holmesburg, Pa., has added the manufacture of propellers to its line. It has engaged the services of the American Screw Propeller Co., Philadelphia, to design a set of stock model propellers in the smaller sizes. These will be laid out by Captain Charles W. Dyson, U. S. N., recognized authority on screw propellers and head of the designing department of the engineering bureau of the navy. Captain Dyson, who is associated with the American Screw Propeller Co. in the capacity of consulting engineer, is the author of "Screw Propellers and Estimation of Power for Propulsion of Ships," a standard work on this subject which

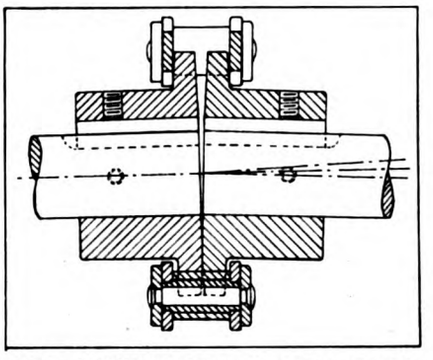


FIG. 2—SECTIONAL VIEW OF COUPLING SHOWING POSITION OF SPROCKETS WHEN SHAFTS MEET AT AN ANGLE

was published in 1913. He designed propellers for the battleships OKLAHOMA, NEW YORK, CALIFORNIA, DELAWARE, TEXAS, ARIZONA, PENNSYLVANIA, IDAHO, and for a number of destroyers. In addition, a large number of yachts as well as tankers, colliers and other merchant vessels have been equipped with Dyson model propellers.

Appointed Assistant

John E. Deasy has been appointed assistant to J. C. Evans, president of the Great Lakes Transit Corporation, with office in the Marine National Bank building, Buffalo, N. Y.

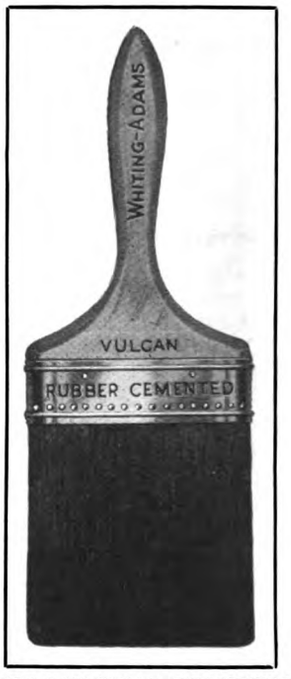
Superheater Installed

While there are about 1,500 steamers, representing over 2,000,000 horsepower, hailing from foreign ports equipped with fire tube superheaters, the launching of PEARL SHELL at the ship yards of Harlan & Hollingsworth Corporation, Wilmington, Del., represents the first fire tube superheater installation in a new steamer built in this country. PEARL SHELL is an oil tanker, and will be operated by the Shell Oil Co., San Francisco. She will sail out of New York harbor for the present at least.

PEARL SHELL is over 400 feet long and represents a gross tonnage of over 5,600. She is equipped with three Scotch marine boilers fitted with Locomotive Superheater Co.,. New York, fire tube superheaters, supplying superheated steam to triple expansion engines, developing 2,400 horsepower. The superheater was applied to PEARL SHELL after the purchasers had determined, to their own satisfaction, the economies and reliability in operation of a superheater of the same design, applied to one of their existing steamers of approximately the same size. The Shell Oil Co. also has contracted for sufficient superheater equipment to convert five more ships.

Marine Brushes

The John L. Whiting-J. J. Adams Co., Boston, has put on the market a line of brushes for painting and varnishing metals. These brushes are said to wear well under hard usage and are particularly adapted for marine work. The bristles and hair of these brushes are saturated with plastic rubber and vulcanized to prevent the hairs from pulling out during use.



VULCAN WEAR RESISTING BRUSH

Describes Products

The American Manganese Bronze Co. has issued an attractive 32-page booklet covering the various types of bronzes which it manufactures. Complete physical data are presented, covering each grade of bronze. The booklet makes special reference to Spare's manganese bronze rods for bolts, shafting, piston rods, etc., for marine service. Bushings, gears, bearings, etc., also are thoroughly described and illustrated. In addition the booklet contains complete directions for melting and pouring various grades of bronze.

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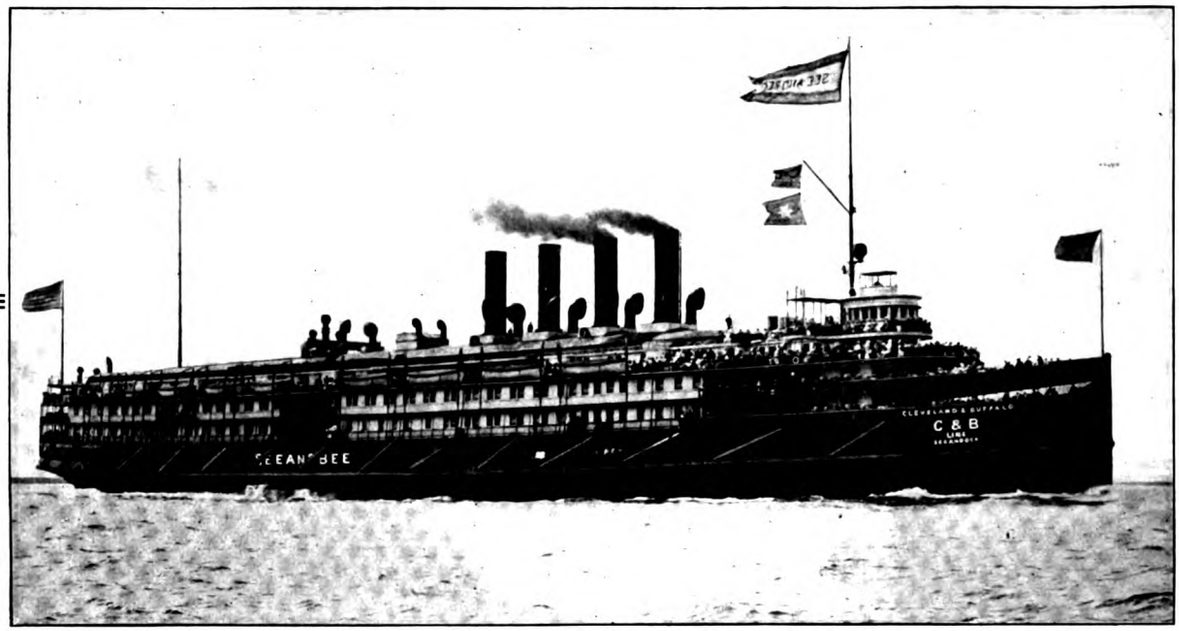


BUILDERS OF **"SEEANDBEE,"** LARGEST SIDE WHEEL STEAMER IN THE WORLD. Designers and builders of all types of

Freight and Passenger Steamers, Engines, Boilers and Auxiliary Machinery

Manufacturers of BRASS MARINE HARDWARE and BRASS SPECIALTIES.
Builders of *Metallic Life Boats* and *Clark Patent Metallic Life Rafts.*

DETROIT SHIPBUILDING COMPANY

M. E. Farr, Pres. and Treas. E. Ketcham, Secretary Frank Jeffrey, Gen. Supt. John D. Langell, Supt. of Dry Docks and Repairs

Established 1852

Steel Shipbuilding Plant at Wyandotte, Michigan. First-class equipment for making hull and machinery repairs.

Dry Docks, Machinery Works and General Offices, Foot of Orleans Street

DETROIT, MICH.

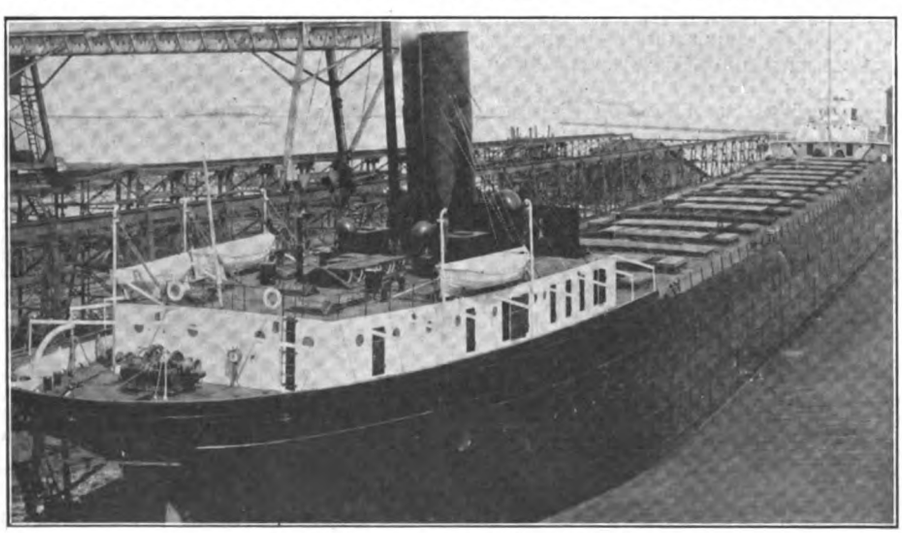
COLLINGWOOD SHIPBUILDING CO.

LIMITED

COLLINGWOOD—ONTARIO—CANADA

STEEL and WOODEN SHIPS, ENGINES, BOILERS, CASTINGS and FORGINGS

PLANT FITTED WITH MODERN APPLIANCES FOR QUICK WORK



Steamer "J. H. G. HAGARTY" Completed

DRY DOCKS and SHOPS EQUIPPED TO OPERATE DAY or NIGHT on REPAIRS

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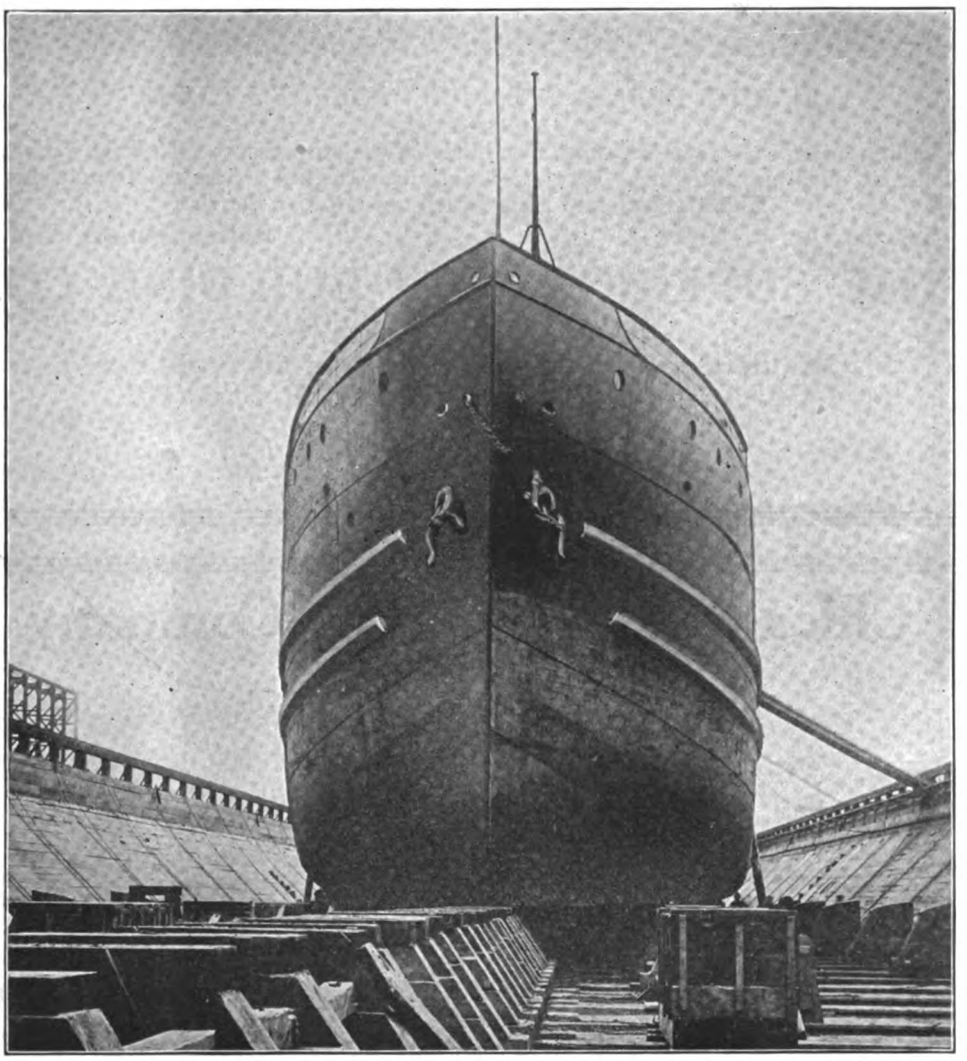
THE TOLEDO SHIPBUILDING COMPANY



Builders and Repairers of Ships and Engines

TOLEDO, OHIO

H. S. WILKINSON, President and Treasurer
C. B. CALDER, Vice President and General Manager
W. G. HENDERSON, General Superintendent
A. D. BLACK, Secretary and Assistant Treasurer
EDWARD HOPKINS, Naval Architect

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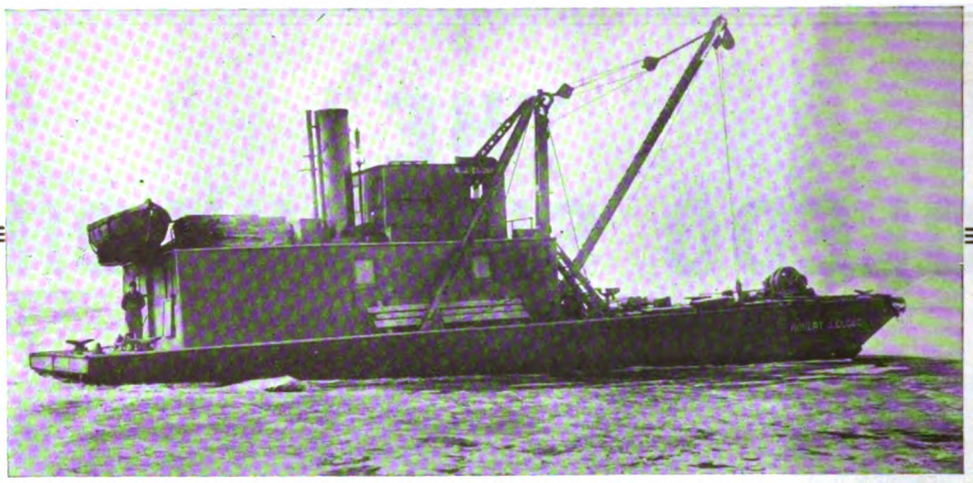


MARINE REPAIR STEAMER "ROBERT J. CLOSE"

Equipped With

Electric Welding Machine—Gas Welding Machine—Air Compressors—Electric Forges—Electric Lathes—Electric Drilling Machine—Electric Grinding Machine—Electric Punch and Shears—Electric Bolt and Pipe Machine—10-Ton Derrick

At Your Service Day or Night :: :: Boiler Repairs Our Specialty

THE SUPERIOR SHIP BUILDING CO.

SUPERIOR, WISCONSIN

Builders and Repairers of Ships of all types for GREAT LAKES and SALT WATER SERVICE.

②—DRYDOCKS—②

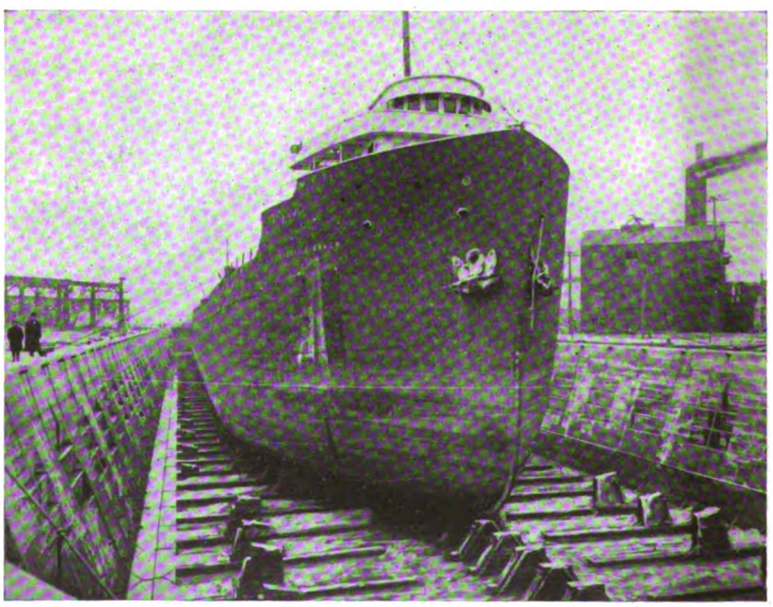
Chicago Ship Building Company

CHICAGO, ILLINOIS

We Build Steel Ships

Passenger or Freight

Any Size



Steamer George F. Baker in Our New Concrete Dock at South Chicago

Dimensions of Dry Dock

	Feet
Length -	734
Width:	
At Top -	103
At Bottom -	88
Depth -	22½

We Operate the Largest Graving Dock on Lake Michigan

Complete Facilities for Rapid Repair Work

Shops and Dry Dock at South Chicago

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"ISHERWOOD"

SYSTEM

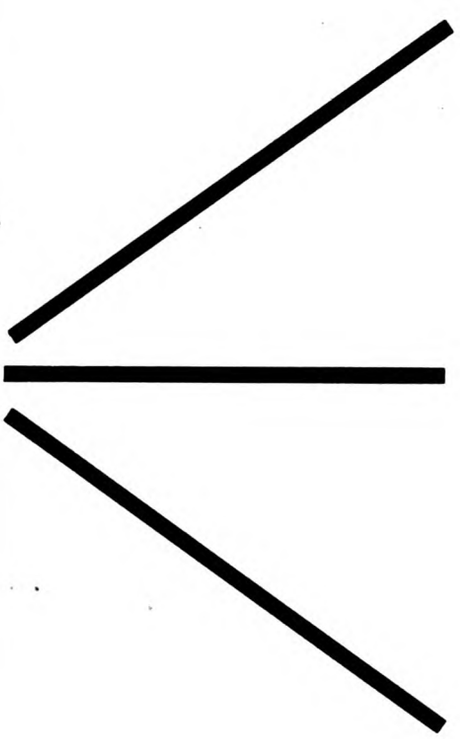
OF

SHIP BUILDING

Experience has proved that this system gives increased strength, increased cubic and deadweight capacity, reduced cost of maintenance, and reduced vibration at no greater first cost than a vessel of similar dimensions built on the transverse system.

Owners who are contemplating the construction of new vessels, of any type whatever, will find this system of construction most advantageous and suitable for all trades.

528 vessels of all types and sizes, representing about 4,104,800 tons deadweight carrying capacity have been built or are now on order, including a good many repeat orders from Owners who have tried the system.



J. W. ISHERWOOD,
4, Lloyd's Avenue,
LONDON, E. C.

Tel. Address:
"ISHERCON, LONDON."

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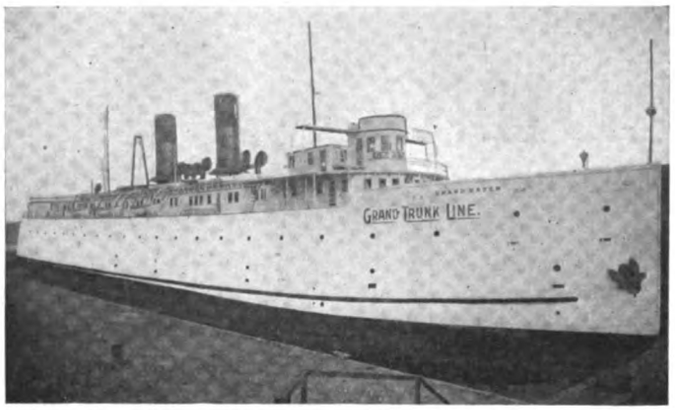
Milwaukee Dry Dock Company

Milwaukee, Wisconsin

Ship Repairs of All Kinds

Also Machine Shop for Engine Repairs



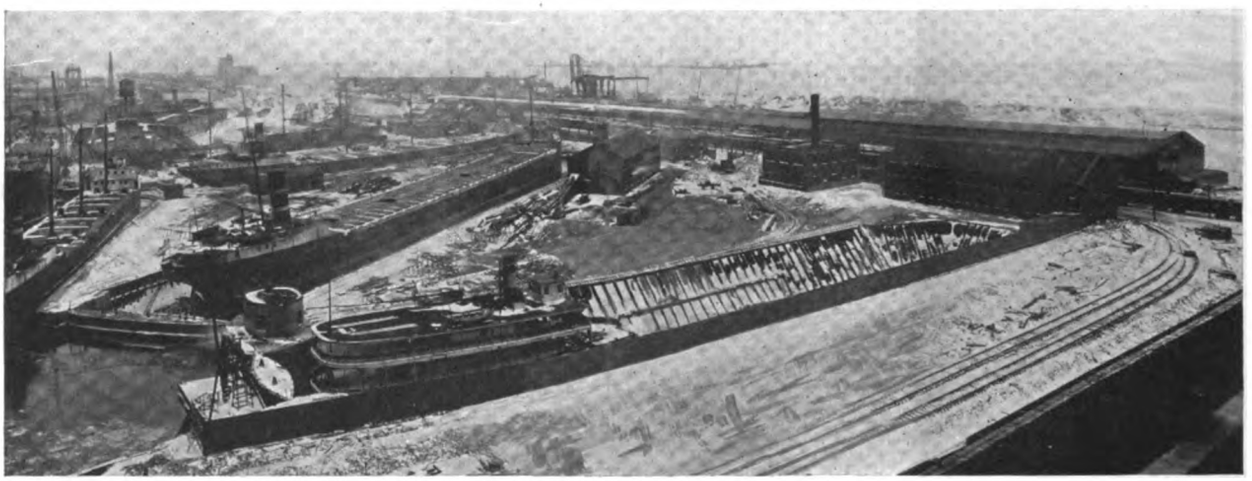
Car Ferry "Grand Haven" in Dry Dock

We have two ship yards offering every facility for the repair of both steel and wooden vessels. South Yard Dock is 450 feet long on keel blocks; 460 feet over all; 60 feet width of gate and 16 feet over sill. West Yard Dock is 312 feet on keel blocks; 45 feet width of gate and 12 feet over sill. Rudder pit in each dock. Electric light for night work.

Residence Phone
F. W. Smith, Manager
Lake 467

Main Office at South Yard
Foot of Washington Street

Telephone—Hanover 3
West Yard—Hanover 2555



The Buffalo Dry Dock Company

BUFFALO, N. Y.

With our excellent equipment we are enabled to do all kinds of ship repairs at reasonable cost to the owners, whose patronage is solicited with the guarantee of satisfaction in all particulars.

EDWARD N. SMITH, Superintendent **WILLIAM KNIGHT, Ass't Sec'y and Treas.**

Office Telephone, Bell, 4055 Seneca: Federal, 22-531

Superintendent's Telephone, Tupper 3012 **Ass't Sec'y's Telephone, 324 North**

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Ours is not the ordinary kind of dry dock. ***One*** of the distinct advantages that we have over others is the ***marine railway,*** which is 500 feet in length. This railway allows us to haul out craft and move them around so that we can take advantage of our 5 acres of property, thus giving us an immense capacity. We employ a force of 75 men who have at their disposal every modern convenience, including a complete mill for getting out material; a large up-to-the-minute, electric derrick; a great number of electric drills, etc. One of the boats on which we are now working, is the fuel lighter, Wm. G. Perry, owned by the Pittsburg Coal Co., length 175 feet; beam 34 feet.

A New, Complete Dry Dock
at Your Service!

We Build, Rebuild and Repair

anything that floats, up to 200 feet in length, and with draft not exceeding 12 feet.

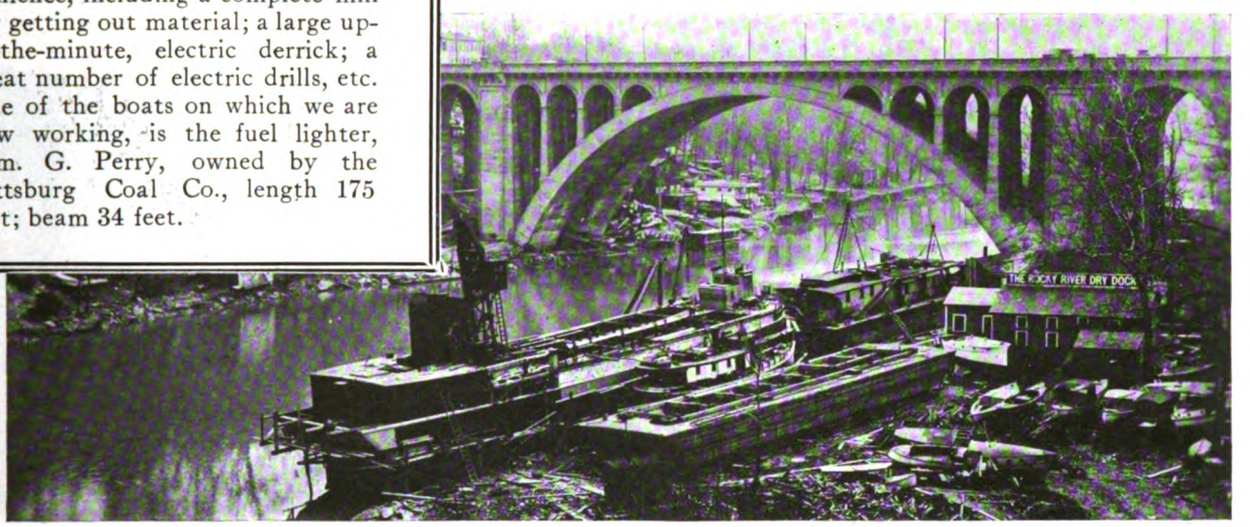
We specialize

Large and small ***Vessels, Tugs, Power Boats*** and ***Yachts.***

Put your proposition up to us and you will not be disappointed.

ROCKY RIVER DRY DOCK COMPANY

ROCKY RIVER - - - - OHIO



Tietjen & Lang Dry Dock Co.

HOBOKEN, N. J.

NINE DRY DOCKS

General Repairs on Wooden and Iron Vessels

FT. OF 17th STREET

Telephone 700 Hoboken **HOBOKEN, N. J.**

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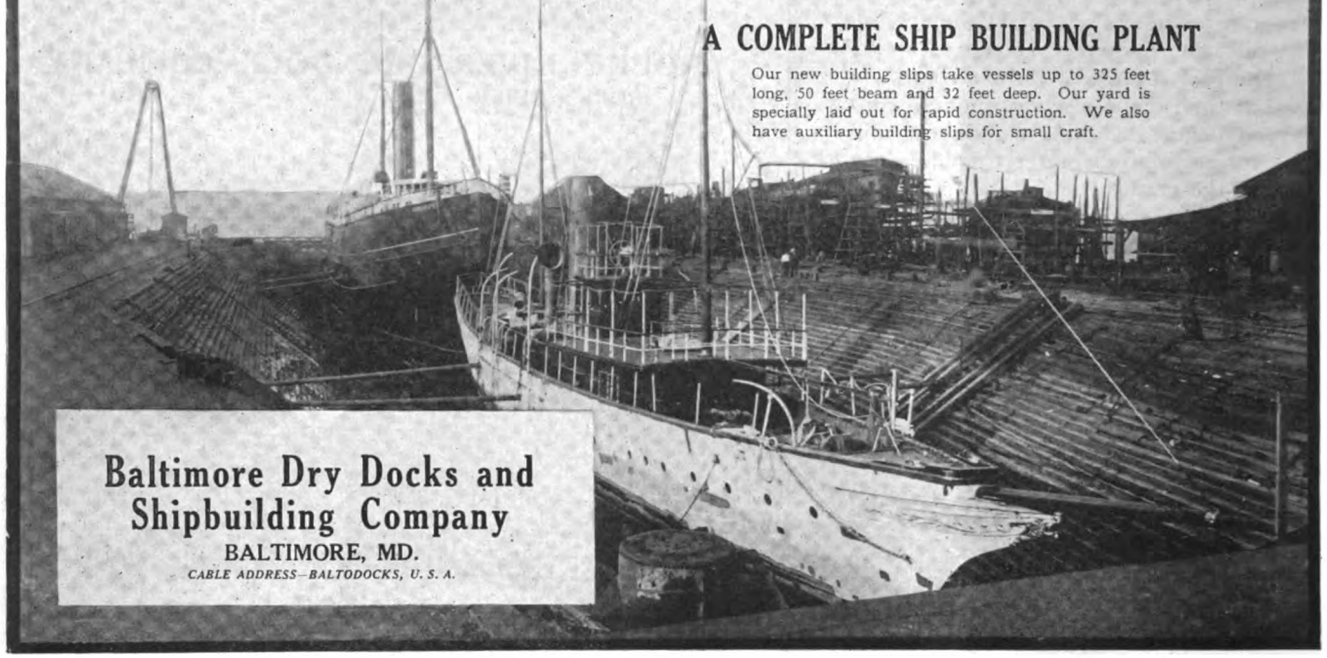
OUR DRY DOCKS SAVE TIME

Two Docks, coupled with Complete Shop Facilities, cut repair periods to a minimum

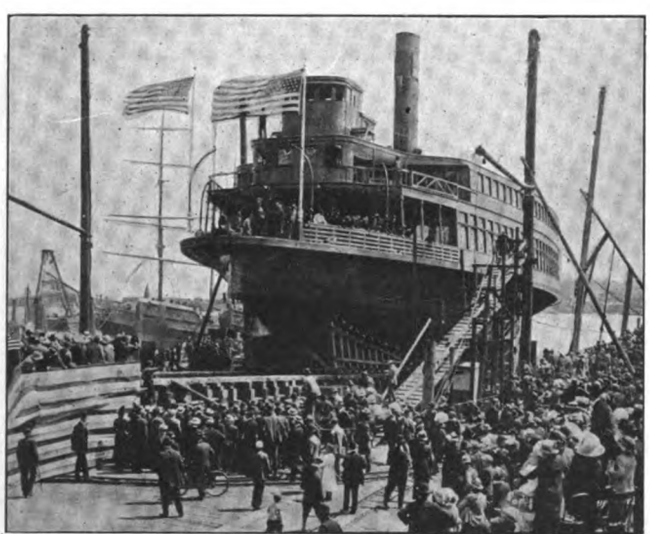
	Upper Dock	Lower Dock
Length on Keel Blocks, feet	600	437
Width of Dock Floor, feet	62	50
Draft Over Sill at Low Water	22½	22½

A COMPLETE SHIP BUILDING PLANT

Our new building slips take vessels up to 325 feet long, 50 feet beam and 32 feet deep. Our yard is specially laid out for rapid construction. We also have auxiliary building slips for small craft.

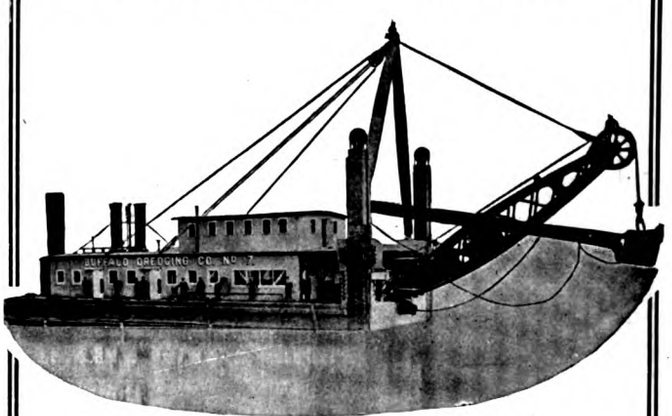


Baltimore Dry Docks and Shipbuilding Company
BALTIMORE, MD.
CABLE ADDRESS—BALTODOCKS, U. S. A.



Moore and Scott Iron Works
Engineers and Ship Builders
SAN FRANCISCO, CAL.

MODERN MARINE BOILERS
and
STEEL SHIP BUILDING



TUGS, PASSENGER STEAMERS and SPECIAL CONSTRUCTION
WRITE
JOHNSTON BROTHERS
FERRYSBURG, MICHIGAN

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LARGEST FLOATING DRY DOCK EQUIPMENT ON THE PACIFIC COAST

Completely Equipped Shops for Ship, Engine and Boiler

REPAIRS

Ship Builders, Engine Builders, Boiler Makers, Iron Founders, Brass Founders, Lumber Manufacturers

PARSONS' MARINE STEAM TURBINES—YARROW BOILERS

Cable Address: "THREEDOCKS"—Codes: Western Union, A. B. C., 5th ed. and Bentley's

Seattle Construction & Dry Dock Company

SEATTLE, WASHINGTON

Manitowoc Shipbuilding Co.

Designers and Builders of

Steel Passenger Boats
Steel Freighters
Sand Suckers
Dredges
Floating Cranes
Lighters
Fireboats
Tugs
Dump Scows
Marine Engines
Semi Diesel Engines
Marine Boilers
Deck Machinery, etc.

Facilities for prompt and economical repairs

MANITOWOC - WISCONSIN

BATH IRON WORKS

LIMITED

BATH, MAINE

Shipbuilders and Engineers

Licensee for
Parson's Marine Turbines,
Normand Express Water Tube Boilers.

Particular Attention Given to
High Speed Requirements
Estimates Furnished.

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National Defense and International Peace

Business and Patriotism

A Non-partisan Appeal to the Nation

THE WHITE HOUSE
Washington

April 21, 1916.

To the Business Men of America:

I bespeak your cordial co-operation in the patriotic service undertaken by the engineers and chemists of this country under the direction of the Industrial Preparedness Committee of the Naval Consulting Board of the United States.

The confidential industrial inventory you are asked to supply is intended for the exclusive benefit of the War and Navy Departments, and will be used in organizing the industrial resources for the public service in national defense.

At my request, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Chemical Society are gratuitously assisting the Naval Consulting Board in the work of collecting this data, and I confidently ask your earnest support in the interest of the people and government of the United States.

Faithfully Yours, Woodrow Wilson

COMMITTEE ON INDUSTRIAL PREPAREDNESS
OF
NAVAL CONSULTING BOARD OF THE UNITED STATES
IN CO-OPERATION WITH

The American Society of Civil Engineers
The American Society of Mechanical Engineers
The American Institute of Mining Engineers
The American Institute of Electrical Engineers
The American Chemical Society

ENGINEERING SOCIETIES BUILDING
29 WEST 39th STREET, - NEW YORK

Advertisement designed by the ASSOCIATED ADVERTISING CLUBS OF THE WORLD and published free by this publication.

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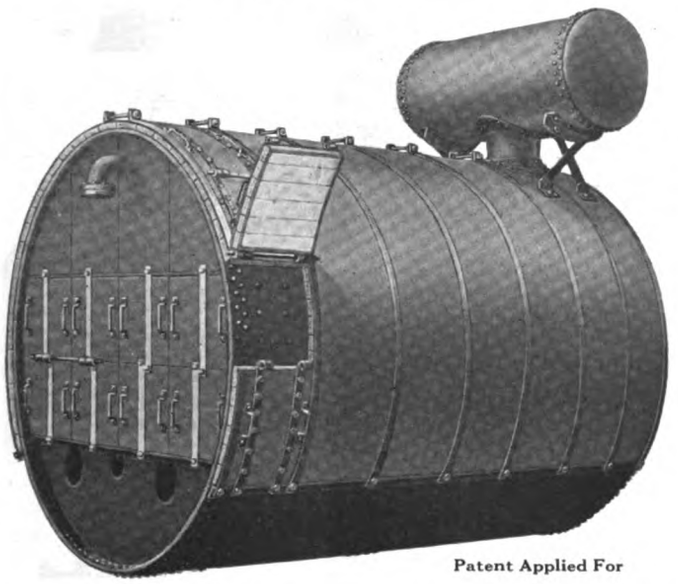
Something New—A Boiler Covering in Panels



Patent Applied For

Your Stay Bolts Instantly Accessible

Each panel lifts on its hinge as shown, or a whole section may be removed with a single strap.

Carey Covering in Panels

Is made to fit every size and type boiler. Easy to install on old boilers—a saving in time and money on new construction.

Send for Special Folder and Prices

THE CAREY COMPANY

Cleveland, Ohio

Holding the Records in the Navies of the World

The records for Economy, Capacity and Endurance in the Navies of the World, are held by

BABCOCK & WILCOX FORGED STEEL

Marine Water-Tube Boilers

and

Superheaters

Moreover, the same superior characteristics have been proved in the Merchant Marine.

Do you know that Babcock & Wilcox Boilers and Superheaters in one vessel are saving more than 15 per cent over Scotch boilers in sister vessels?

Isn't such a great reduction in coal bills of very great interest to you?

All essential parts of Babcock & Wilcox Boilers are heavier than the corresponding parts in Scotch boilers, thus giving greater security against corrosion.

Let us send you full details explaining why "Babcock & Wilcox" stands for **safety, ease of cleaning** and **simplicity of operation.**

A large portion of our business consists of "repeat-orders." You know what that means. ***Write us at once.***

The Babcock & Wilcox Co.

NEW YORK and LONDON

Eckliff Boiler Circulators

Getting along without *Eckliff Circulators* means getting along without *Circulation;* and getting along without circulation means unnecessary trouble and expense. Eckliff-equipped boilers steam easier—burn less fuel—have no leaks—and are free from all troubles which result from lack of circulation.

"Watch the Thermometer"

Send for the Booklet.

Eckliff Automatic Boiler Circulator Co.

NEW YORK SINGER BLDG. **DETROIT** 54 SHELBY ST. **PHILADELPHIA** BULLITT BUILDING

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WATERBURY CORDAGE

For All Marine Uses

In All Standard Grades

Years of experience in rope making insures the very highest quality in respective grades.

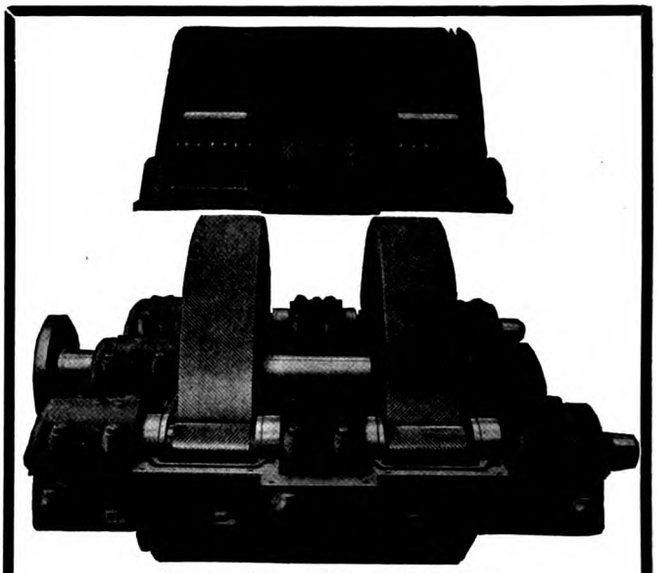
Write to our nearest office for prices and deliveries on Waterbury Cordage. Also Waterbury "Green Strand," "Armored" and "Fibreclad" Wire Rope.

WATERBURY
FOUNDED 1816

WATERBURY COMPANY

63 PARK ROW, NEW YORK

CHICAGO.....419 W. 12th Place
DALLAS, TEX., Powell & Ellet Co., 911 Southwestern Life Bldg.
SAN FRANCISCO.....113 Davis St.
NEW ORLEANS.....1018 Maison Blanche Bldg.



4500 H. P. De Laval Marine Reduction Gear

Use

DE LAVAL

Geared Marine

Steam Turbines

The double-helical speed-reducing gear for steam turbine service was first introduced by De Laval in 1894.

At present over 6500 De Laval Double-helical Speed-Reducing Gears are in successful operation.

De Laval Gears are built by highly skilled workmen from the best materials, and with equipment developed and improved by over 20 years of experience.

All factors entering into the design have been chosen after long experience under practical operating conditions, and all parts are made on a limit gage, interchangeable basis.

The De Laval Double-helical Speed-reducing Gear is not an ingenious idea based upon imperfectly developed theories, but an accomplished fact.

It is based upon the principle that a correctly cut gear, correctly mounted and protected from external distorting forces, will run smoothly and noiselessly and will not be subject to excessive wear or deterioration.

If interested in saving weight and fuel, and in the greater simplicity and lower first cost of geared turbines for ship propulsion, write us, giving particulars of the proposed boat so that we may supply full information.

We are prepared to furnish marine steam turbines and gears in any capacity and for any steam conditions.

DE LAVAL
Steam Turbine Co.
TRENTON, N. J.

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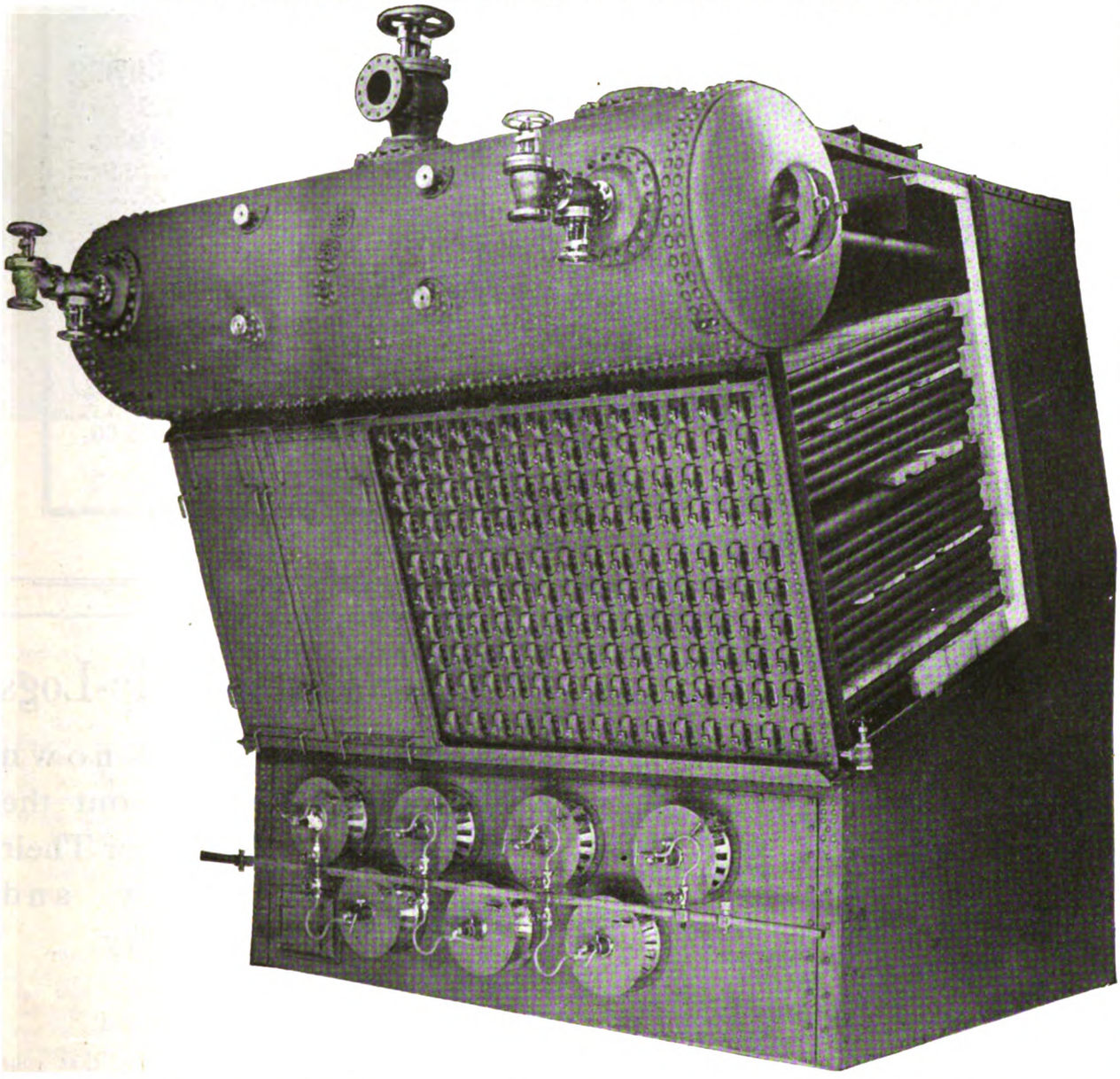
WARD BOILERS
FOR
U. S. SUPPLY SHIP "BRIDGE"
4275 SQUARE FEET HEATING SURFACE EACH



CONTRACT AWARDED AS RESULT OF EVAPORATIVE TRIALS BY UNITED STATES NAVAL BOARD

16.73 POUNDS WATER PER POUND OF OIL
81.68 PER CENT EFFICIENCY

IMPROVED AND MOST RAPID CIRCULATION

The Charles Ward Engineering Works
CHARLESTON, W. VA.

MARINE ENGINES RIVER STEAMERS YACHTS

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against storms, salt air, salt water and deleterious conditions is given by

DIXON'S SILICA PAINT GRAPHITE

to all iron or wood work above or below deck where a dark color paint can be used.

Write for interesting booklet No. 77 B

Made in JERSEY CITY, N. J., by the

Joseph Dixon Crucible Co.

Established 1827

B-123

Several Reasons for Buying WHITING-ADAMS Vulcan Rubber Cemented Brushes

1st. The bristles and hair are highest grade, prepared for use by the WHITING-ADAMS method, which retains toughness, elasticity and a velvet softness of ends. This makes the part of a brush that is used, perfect in quality and long wearing.

2nd. Every bristle and hair is held by pure, best quality **Rubber**; no fake, coal tar, chemical imitation of rubber is used in our factory. "Rubber" means **pure rubber** in all **WHITING-ADAMS Vulcan Rubber Cemented Brushes.** The butts of bristles or hair are completely saturated and surrounded with **strictly pure rubber** in semi-liquid state, and then vulcanized hard as granite.

3rd. WHITING-ADAMS Brushes cost little and wear long. Our large volume of business reduces cost of manufacture to lowest point and selling prices are made near to cost.

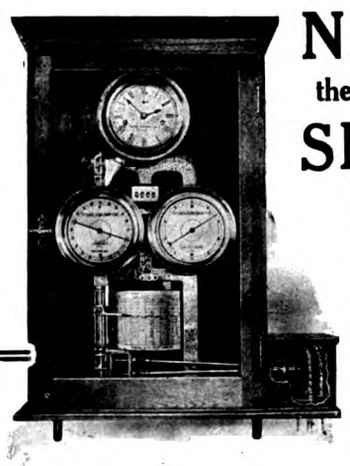
4th. Manufacturing Brushes as we have for over 106 years, means that we know brushes, and users of our brushes receive the full benefit of our brush knowledge.

Send for Illustrated Literature

JOHN L. WHITING-J. J. ADAMS CO.

BOSTON, U. S. A.

Whiting-Adams Brushes Awarded Gold Medal and Official Blue Ribbon, the Highest Award at Panama-Pacific Exposition, 1915.



NICHOLSON

the most advanced type of

SHIP LOG

Gives the mileage sailed, and shows the exact speed per hour on a dial, recording it on a chart for every minute of the trip.

The Nicholson Recording Ship Log is installed on battle ships, passenger ships, bulk freighters, car ferries, yachts, and motor boats.

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NICHOLSON SHIP LOG CO.

Cleveland, O.

Walker's Patent Ship-Logs

Walker's Patent "Cherub" II Ship-Log

Are Known Throughout the World for Their Accuracy and Durability

Unsolicited Testimonial

"I have much pleasure in stating that your Cherub Log has been in constant service for a period of over four years, and has given no trouble whatever. It has during that period registered some 190,000 miles and I have no doubt this is the finest Log in the market at the present time."

Thomas Walker & Son, Ltd.

Makers to the British and Many Other Navies

58 Oxford St. Birmingham, Eng.

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Stevedoring Profits Greatly Increased Using G-E Portable Control Gear

Maximum dispatch, reduced cost, greater safety and lessened damages follow the use of winches equipped with G-E motors and portable controller, the latter hung over operator's shoulders.

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Greater Safety

The operator's eye is always on the business end of whips as he follows draft about and his co-workers are always in sight. All accelerating, speed setting, braking, reversing and stopping is done automatically, since the operator merely starts each operation which is always performed at the same rate of speed by electricity. For instance, the operator turns a handle to start hoisting; he can turn it as fast as he wishes but the hoisting will not be done any faster than the electrical control permits. If he wishes, a very slow speed can be obtained, but the uniform rate enables co-workers and operator to judge movements accurately.

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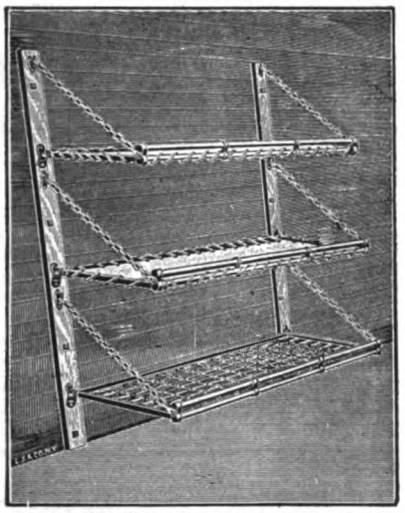

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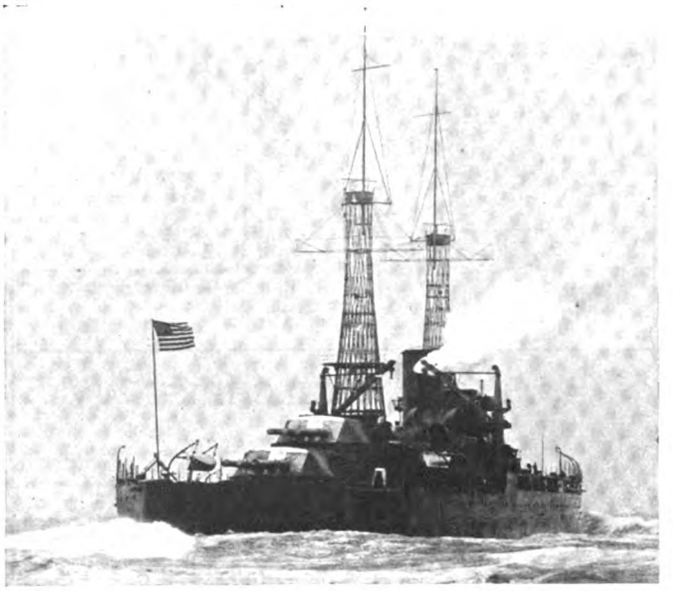

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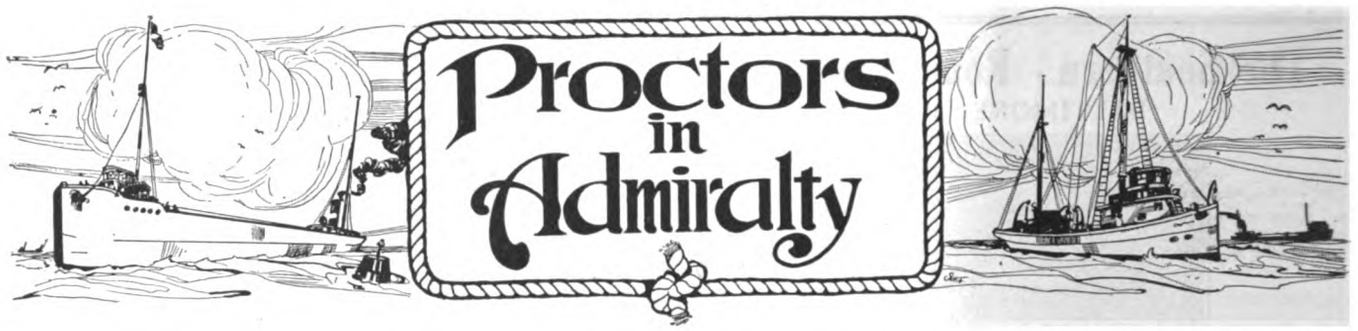

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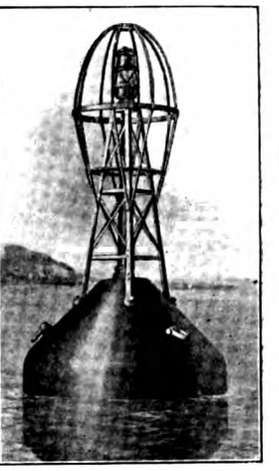

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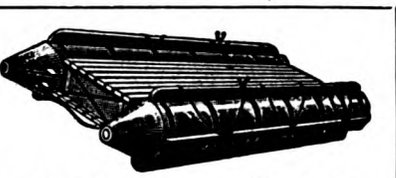

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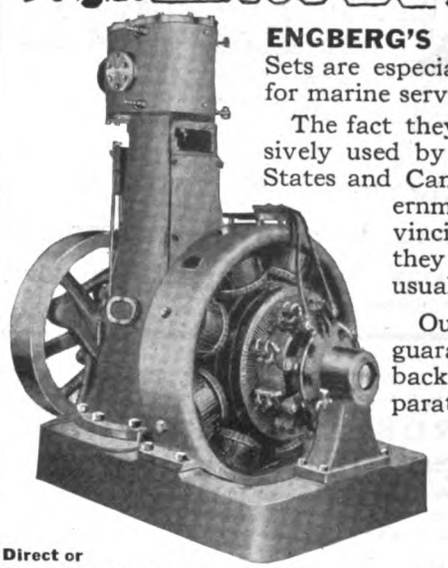

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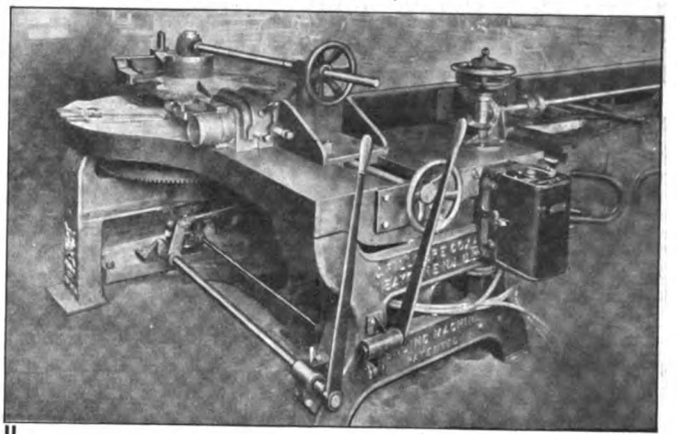

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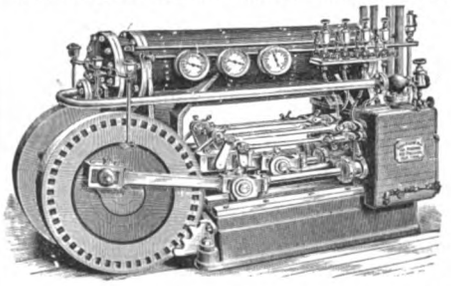

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Dixon, Joseph Crucible Co., Jersey City, N. J.

BOILER NOZZLES.
(Welded Steel.)
Continental Iron Works, The, Brooklyn, N. Y.

BOILER STEAM AND WATER DRUMS.
(Welded.)
Continental Iron Wks., The, Brooklyn, N. Y.

BOILERS.
Baltimore Dry Dock & Shipbuilding Co., Baltimore, Md.
Collingwood Ship Bldg. Co., Ltd., Collingwood, Ont.
Lake Erie Boiler Works, Buffalo, N. Y.

BOILERS.
(Marine.)
Almy Water Tube Boiler Co., Providence, R. I.
American Ship Building Co., Cleveland, O.
Babcock & Wilcox Co., New York, N. Y.
Bath Iron Works, Bath, Me.
Chicago Ship Bldg. Co., So. Chicago, Ill.
Commercial Boiler Works, The, Seattle, Wash.
Delaney, P., & Co., Newburgh, N. Y.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. A., & Co., Hoboken, N. J.
Johnson Bros., Ferrysburg, Mich.
Kingsford Fdy. & Mch. Wks., Oswego, N. Y.
Lake Erie Boiler Works, Buffalo, N. Y.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moore & Scott Iron Works, San Francisco.
Seattle Construction & Dry Dock Co., Seattle.
Superior Ship Bldg. Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Ward, Chas., Engrg. Co., Charleston, W. Va.

BOILERS.
(Water Tube.)
Ward, The Chas., Engrg. Works., Charleston, W. Va.

BOILER REPAIRS.
Commercial Boiler Works, The, Seattle, Wash.

BOAT REPAIRS.
Rocky River Dry Dock Co., Rocky River, O.

BOOKS.
Penton's Book News, Cleveland, O.

BRASS GOODS.
Penberthy Injector Co., Detroit, Mich.
Williams, Wm. E., New York, N. Y.

BRASS SPECIALTIES.
Detroit Ship Building Co., Detroit, Mich.
Williams, Wm. E., New York, N. Y.

BROKERS.
(Vessel.)
Boland & Cornelius, Buffalo, N. Y.
Richardson, W. E., & Co., Cleveland, O.
Sullivan, D., & Co., Chicago, Ill.

BRONZE.
(Manganese.)
American Manganese Bronze Co., Holmesburg, Pa.

BRONZE SCREW PROPELLERS.
American Manganese Bronze Co., Holmesburg, Pa.

BRUSHES, GRAPHITE.
(For Motor or Dynamo.)
Dixon, Joseph, Crucible Co., Jersey City, N. J.

BRUSHES.
(Vulcan Rubber Cemented.)
John L. Whiting—J. J. Adams Co., Boston.

BUOYS.
Kahnweiler's, David, Sons, New York City.
Williams, Wm. E., New York, N. Y.

BUOYS.
(Gas and Spar.)
Safety Car Heat'g & Light'g Co., New York.

BUSHINGS.
(Adjustable.)
Armstrong Mfg. Co., Bridgeport, Conn.

CABLES.
Durable Wire Rope Co., Boston, Mass.
Waterbury Co., New York, N. Y.
Williams, Wm. E., New York, N. Y.

CAPSTANS.
American Engineering Co., Philadelphia, Pa.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.

CARPENTERS.
Baltimore Dry Dock & Shipbuilding Co., Baltimore, Md.

CASTINGS.
Collingwood Ship Bldg. Co., Collingwood, Ont.

CASTINGS.
(Brass and Bronze.)
Dake Engine Co., Grand Haven, Mich.
Trout, H. G., Co., Buffalo, N. Y.

CAULKING COTTON.
Stratford Oakum Co., Geo., Jersey City, N. J.

CHOCKS.
American Engineering Co., Philadelphia, Pa.
Welin Marine Equipment Co., Long Island City, N. Y.

CIRCULATORS.
(Boiler.)
Eckliff Automatic Boiler Circulator Co., Detroit, Mich.
McNab Co., Bridgeport, Conn.

COAL.
(Producers and Shippers.)
Hall, Geo., Coal Co., Ogdensburg, N. Y.
Hanna, M. A., & Co., Cleveland, O.
Lorain Coal & Dock Co., Columbus, O.
Pickands, Mather & Co., Cleveland, O.
Pittsburgh Coal Co., Pittsburgh, Pa.

COMPASSES.
Ritchie, E. S., & Sons, Brookline, Mass.

CONDENSERS.
American Engineering Co., Philadelphia, Pa.
Williams, Wm. E., New York, N. Y.

CONDENSER SHELLS.
(Welded Steel.)
Continental Iron Works, The, Brooklyn, N. Y.

CONVEYORS.
General Electric Co., Schenectady, N. Y.

CORDAGE.
Waterbury Co., New York, N. Y.
Williams, Wm. E., New York, N. Y.

CORK.
Brauer, Justus, & Sons, Inc., Philadelphia, Pa.

CORK JACKETS AND CORK RINGS.
Kahnweiler's, David, Sons, New York, N. Y.
Williams, Wm. E., New York, N. Y.

COUCHES AND COTS.
(Folding.)
Southern-Rome Co., Baltimore, Md.

COUCH HAMMOCKS.
Southern-Rome Co., Baltimore, Md.

COUNTERS.
(Averaging.)
Cummings Ship Instrument Works, Boston.

COVERING.
(Boiler.)
Carey, The, Co., Cleveland, O.

CRANES.
General Electric Co., Schenectady, N. Y.

CRANES.
(Dock.)
American Engineering Co., Philadelphia, Pa.

CRANES.
(Electric Boat.)
American Engineering Co., Philadelphia, Pa.

CRANES.
(Locomotive.)
American Engineering Co., Philadelphia, Pa.

CRAYONS.
(Lumber.)
Dixon, Joseph, Crucible Co., Jersey City, N. J.

CUTTERS.
(Pipe.)
Armstrong Mfg. Co., Bridgeport, Conn.

CYLINDERS.
(Welded.)
Continental Iron Works, The, Brooklyn, N. Y.

DAVITS.
Welin Marine Equipment Co., Long Island City, N. Y.

DAVITS AND DAVIT FALLS.
Welin Marine Equipment Co., Long Island City, N. Y.

DERRICKS.
Dake Engine Co., Grand Haven, Mich.
Superior Iron Works, Superior, Wis.

DESIGNERS.
(Ship.)
Babcock & Penton, Cleveland, O.
Curr, Robert, Port Arthur, Ont., Can.
Furstenau, M. C., Philadelphia, Pa.

DIES.
Armstrong Mfg. Co., Bridgeport, Conn.

DIVING APPARATUS.
Morse, A. J., & Son, Boston, Mass.
Schrader's, A., Sons, Inc., Brooklyn, N. Y.

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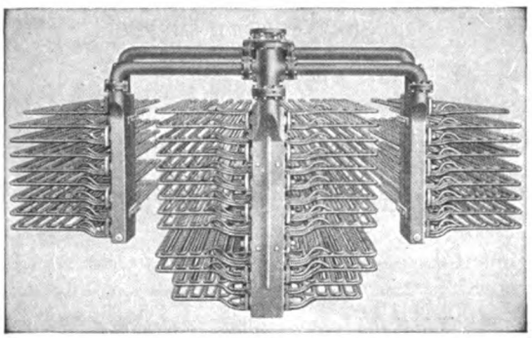
2. It renders possible an increase in output of boiler horse power from a given boiler plant, 10% to 20%.

3. It will produce the same power output with fewer boilers.

4. It reduces the size of the bunkers, thereby reducing the draft of the vessel with a given cargo or making possible an increase in revenue cargo.



5. It results in a saving of fuel over saturated plants, both operating under the same draft conditions, of 10% to 20%.

6. It reduces the maintenance costs by the prevention of water hammer, leaky flanges and condensation in the cylinders.

7. It does not prevent rapid, thorough and frequent cleaning of the tubes.

8. Its construction provides easy access to all screwed joints and the easy removal of the parts.

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LUTHER D. LOVEKIN, M. E.

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RAYMOND E. LOVEKIN

NAVY STANDARD BINNACLE

RITCHIE

Compasses, Binnacles,

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DRAFT.
(Artificial and Mechanical for Boilers.)
American Ship Building Co., Cleveland, O.
Detroit Ship Building Co., Detroit, Mich.

DRAFT GAGE.
Blackmer Rotary Pump Co., Petoskey, Mich.
McNab Co., Bridgeport, Conn.

DRAFT REGISTERING INSTRUMENTS.
Pneumercator, The, Co., New York City, N. Y.

DREDGING MACHINERY.
American Engrg. Co., Philadelphia, Pa.
Chase Machine Co., Cleveland, O.
Superior Ship Building Co., Superior, Wis.

DREDGING OUTFIT CONSTRUCTORS.
Buffalo Dry Dock Co., Buffalo, N. Y.

DROPS.
(Wharf.)
American Engineering Co., Philadelphia, Pa.

DRY DOCKS.
American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Ship Bldg. Co., Baltimore, Md.
Chicago Ship Building Co., Chicago, Ill.
Collingwood Ship Bldg. Co., Ltd., Collingwood, Ont., Can.
Detroit Ship Building Co., Detroit, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Rocky River Dry Dock Co., Rocky River, O.
Seattle Construction & Dry Dock Co., Seattle, Wash.
Superior Ship Building Co., Superior, Wis.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.
Toledo Ship Building Co., Toledo, O.

DYNAMOS.
General Electric Co., Schenectady, N. Y.

EJECTORS.
Penberthy Injector Co., Detroit, Mich.

ELECTRICALLY CONTROLLED DEVICE.
Electric Control Co., New York City, N. Y.

ENAMELS.
Patterson-Sargent Co., Cleveland, O.

ENGINEERS.
(Marine, Mechanical and Consulting.)
Babcock & Penton, Cleveland, O.
Donnelly, Wm. T., New York, N. Y.
Farley, Edward P., Co., Chicago, Ill.
Furstenau, M. C., Philadelphia, Pa.
Griscom-Russel, The, Co., New York City.
Moore & Scott Iron Works, San Francisco.
Seattle Construction & Dry Dock Co., Seattle.

ENGINEERS' SPECIALTIES.
Penberthy Injector Co., Detroit, Mich.
Ross Valve Co., Troy, N. Y.
Williams, Wm. E., New York, N. Y.

ENGINES.
American Engineering Co., Philadelphia, Pa.
American Ship Building Co., Cleveland.
Chase Machine Co., Cleveland, O.
Seattle Construction & Dry Dock Co., Seattle.
Superior Iron Works, Superior, Wis.

ENGINES.
(Hoisting.)
American Engineering Co., Philadelphia, Pa.
Chase Machine Co., Cleveland, O.
Superior Iron Works, Superior, Wis.

ENGINES.
(Marine.)
American Ship Building Co., Cleveland, O.
Bath Iron Works, Bath, Me.
Chase Machine Co., Cleveland, O.
Chicago Ship Bldg. Co., So. Chicago, Ill.
Collingwood Ship Building Co., Ltd., Collingwood, Ont., Can.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. A., Co., Hoboken, N. J.
Fore River Ship Bldg. Corp., Quincy, Mass.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Co., Buffalo, N. Y.
Ward, Chas., Engrg. Co., Charleston, W. Va.

ENGINES.
(Mooring.)
American Engineering Co., Philadelphia, Pa.
Chase Machine Co., Cleveland, O.

ENGINES.
(Steering.)
American Engineering Co., Philadelphia, Pa.

ENGINE STOPPING DEVICES.
Mulholland Hatch-Fastener Co., Cleveland, O.

EUROPEAN PASSENGERS & FREIGHT.
American Line, New York, N. Y.
International Mercantile Marine Co., New York, N. Y.

FASTENERS.
(Hatch.)
Mulholland Hatch-Fastener Co., Cleveland, O.

FILTERS.
(Feed Water.)
Griscom-Russell, The, Co., New York City.
Ross Valve Mfg. Co., Troy, N. Y.
Williams, Wm. E., New York, N. Y.

FIRE ESCAPES.
McArthur Portable Fire Escape Co., Cleveland

FIRE ALARM SYSTEMS.
Cory, Chas., & Sons, New York, N. Y.

FIRE DEPARTMENT SUPPLIES.
Morse, A. J., & Son, Boston, Mass.
Williams, Wm. E., New York, N. Y.

FIXTURES.
General Electric Co., Schenectady, N. Y.

FLANGES.
(Forged Steel Boiler.)
Scully Steel & Iron Co., Chicago, Ill.

FLOOR PLATES.
(Wrought Steel Diamond & Ribbed Pattern.)
Scully Steel & Iron Co., Chicago, Ill.

FLUE CLEANERS.
(Soot and Scale.)
Scully Steel & Iron Co., Chicago, Ill.

FORGINGS.
Collingwood Ship Bldg. Co., Ltd., Collingwood, Ont., Can.

FORGINGS.
(Steel.)
Fore River Ship Bldg. Corp., Quincy, Mass.

FOUNDERS.
Chase Machine Co., Cleveland, O.
Kingsford Fdy. & Mach. Co., Oswego, N. Y.
Seattle Const. & Dry Dock Co., Seattle, Wash.

FRICTION BOARD.
Stratford Oakum Co., Geo., Jersey City, N. J.

FUELING COMPANIES AND COAL DEALERS.
Hall, Geo., Coal Co., Ogdensburg, N. Y.
Hanna, M. A., & Co., Cleveland, O.
Lorain Coal & Dock Co., Columbus, O.
Pickands, Mather & Co., Cleveland, O.
Pittsburgh Coal Co., Pittsburgh, Pa.

FURNACES.
(Boilers.)
Continental Iron Works, The, Borough of Brooklyn, N. Y.

FURNACE FRONTS AND DOORS.
(Land and Marine.)
Continental Iron Works, The, Borough of Brooklyn, N. Y.

GAGES.
(Steam.)
Ashton Valve Co., Boston, Mass.
Williams, Wm. E., New York, N. Y.

GAGES.
(Water.)
Penberthy Injector Co., Detroit, Mich.
Williams, Wm. E., New York, N. Y.

GEARS.
(Marine Reduction.)
Hunt, Mirk & Co., San Francisco, Cal.
Hunt, Mirk & Co., Seattle, Wash.
Westinghouse Mch. Co., Pittsburgh, Pa.

GENERATORS.
General Electric Co., Schenectady, N. Y.
International Oxygen Co., New York, N. Y.

GRAIN TRIMMERS.
Co-Operative Grain Trimmers, Fort William, Ont., Can.

GRAPHITE.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

GRAPHITE.
(Boiler Lubricating, Greases.)
Dixon, Joseph, Crucible Co., Jersey City, N. J.

GRATE BARS.
Trout, H. G., Co., Buffalo, N. Y.
Williams, Wm. E., New York, N. Y.

GREASES.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

GYPSEYS.
(Steam.)
American Engrg. Co., Philadelphia, Pa.

HAMMERS.
(Steam.)
Chase Machine Co., Cleveland, O.

HANDLERS.
(Boat.)
Scott, The T. A., Co., New London, Conn.

HATCH FASTENERS.
Mulholland Hatch-Fastener Co., Cleveland, O.

HEATERS AND PURIFIERS.
(Feed Water.)
Ross Valve Mfg. Co., Troy, N. Y.
Williams, Wm. E., New York, N. Y.

HOISTS.
(Air.)
American Ship Building Co., Cleveland, O.

HOISTS.
(Anchor.)
Superior Iron Works, Superior, Wis.

HOISTS.
(Cargo, Etc.)
American Engineering Co., Philadelphia, Pa.
Boston & Lockport Block Co., East Boston, Mass.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
General Electric Co., Schenectady, N. Y.

HOISTS.
(Chain.)
Dake Engine Co., Grand Haven, Mich.
Williams, Wm. E., New York, N. Y.

HOISTS.
(Electric.)
American Engineering Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.

HOISTS.
(Pneumatic.)
Dake Engine Co., Grand Haven, Mich.

HOSE.
Schrader's, A., Son, Inc., Brooklyn, N. Y.
Williams, Wm. E., New York, N. Y.

HOTELS.
Hotel Tuller, Detroit, Mich.

HYDROGEN GENERATORS.
International Oxygen Co., New York, N. Y.

ICE MACHINES.
Clothel Co., The, New York City, N. Y.
Roelker, H. B., New York City, N. Y.

INDICATORS.
Cummings Ship Instrument Wks., Boston.
Electro-Dynamic Co., Bayonne, N. J.
McNab Co., Bridgeport, Conn.

INDICATORS.
(Direction.)
Cummings Ship Instrument Works, Boston.
Electro-Dynamic Co., Bayonne, N. J.
McNab Co., Bridgeport, Conn.

INDICATORS.
(Recording.)
McNab Co., Bridgeport, Conn.

INDICATORS.
(Speed.)
Cummings Ship Instrument Works, Boston.
McNab Co., Bridgeport, Conn.

INJECTORS.
Penberthy Injector Co., Detroit, Mich.
Williams, Wm. E., New York, N. Y.

INSURANCE.
(Marine.)
Boland & Cornelius, Buffalo, N. Y.
Hutchinson & Co., Cleveland, O.
Richardson, W. C., & Co., Cleveland, O.
Vance & Joys, Milwaukee, Wis.

IRON ORE.
Hanna, M. A., & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON SHIP REPAIRS.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.

JOINER WORK.
Baltimore Dry Dock & Shipbuilding Co., Baltimore, Md.

LADDERS.
(Portable.)
McArthur Portable Fire Escape Co., Cleveland

LAMPS.
(Mazda and Arc.)
General Electric Co., Schenectady, N. Y.
Williams, Wm. E., New York, N. Y.

LANTERNS.
(Buoy.)
Safety Car Heating & Lighting Co., New York.

LAUNCHES.
Drein, Thomas, & Son, Wilmington, Del.

LIFE BOATS.
Detroit Ship Bldg. Co., Detroit, Mich.
Drein, Thomas, & Son, Wilmington, Del.
Kahnweiler's, David, Sons, New York, N. Y.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.
Welin Marine Equipment Co., Long Island City, N. Y.
Williams, Wm. E., New York, N. Y.

LIFE RAFTS.
Detroit Ship Building Co., Detroit, Mich.
Drein, Thos., & Son, Wilmington, Del.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.

LIFE BOAT RELEASING DEVICE.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.
Mulholland Hatch Fastener Co., Cleveland, O.

LIFE BOAT SYSTEM.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.
Welin Marine Equipment Co., Long Island City, N. Y.

LIFE PRESERVERS.
Brauer, Justus, & Son, Inc., Philadelphia, Pa.
Kahnweiler's, David, Sons, New York City.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.

LIFE PRESERVERS.
(Ilanasilk.)
Robinson-Roders Co., The, Newark, N. J.

LIFE SAVING EQUIPMENT.
Brauer, Justus, & Son, Inc., Philadelphia, Pa.
Drein, Thos., & Son, Wilmington, Del.
Kahnweiler's, David, Sons, New York City.
Lane, C. M., Life Boat Co., Brooklyn, N. Y.
Welin Marine Equipment Co., Long Island City, N. Y.

LIGHTS.
Safety Car Heating & Lighting Co., New York City.

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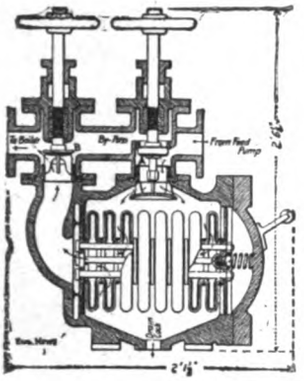

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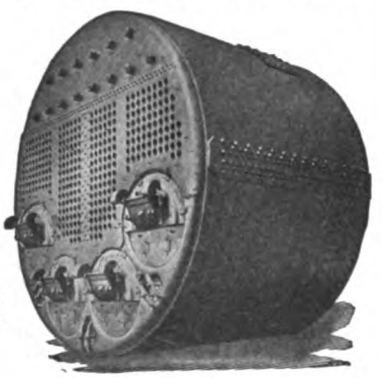

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Guaranteed to give Unequalled Efficiency, Durability and Perfect Satisfaction

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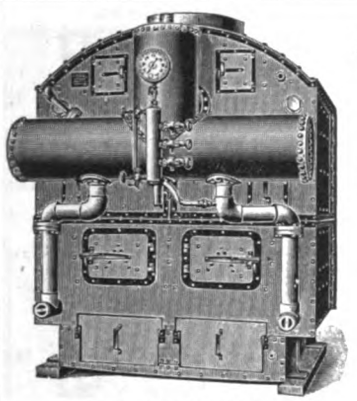

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Providence, R. I. U. S. A.

CATALOGUE FREE

MARINE BOILERS

OF ALL TYPES

KINGSFORD FOUNDRY & MACHINE WORKS,
Oswego, N. Y.

MARINE BOILERS

Marine Repairs

Newburgh Steam Boiler Works

P. DELANY & CO.
Newburgh, N. Y.

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If FUEL COAL is needed on the St. Lawrence River

HALL'S COAL
HALL'S SERVICE
HALL'S PRICE

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MONTREAL, P. Q. OGDENSBURG, N. Y.

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LIGHTS.
(Electric.)
Cory, Chas., & Son, New York City, N. Y.
General Electric Co., Schenectady, N. Y.

LIME ISLAND DOCK.
Pittsburgh Coal Co., Pittsburgh, Pa.

LOCOMOTIVE SUPERHEATERS.
Locomotive Superheater Co., New York, N. Y.

LOGS.
(Patent.)
Cummings Ship Instrument Works, Boston.

LOGS.
(Ship.)
Nicholson Ship Log Co., Cleveland, O.
Walker, Thomas & Son, Birmingham, Eng.

LUBRICANTS.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

LUBRICATING GRAPHITE.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

LUBRICATORS.
Penberthy Injector Co., Detroit, Mich.

MACHINERY.
Kingsford Fdy. & Machine Co., Oswego, N. Y.

MACHINERY.
(Marine.)
American Ship Building Co., Cleveland, O.
Chase Machine Co., Cleveland, O.
Chicago Ship Building Co., South Chicago, Ill.
Collingwood Ship Building Co., Ltd., Collingwood, Ont., Can.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Fore River Ship Building Corp., Quincy, Mass.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Superior Iron Works, Superior, Wis.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.

MACHINISTS.
Chase Machine Co., Cleveland, O.
Seattle Construction & Dry Dock Co., Seattle, Wash.
Superior Iron Works, Superior, Wis.

MANGANESE BRONZE.
American Manganese Bronze Co., Holmesburg, Pa.

MARINE BOILERS AND MACHINERY.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.

MARINE RAILWAY.
Rocky River Dry Dock Co., Rocky River, O.

MARINE REDUCTION GEARS.
Hunt, Mirk & Co., San Francisco, Cal.
Hunt, Mirk & Co., Seattle, Wash.
Westinghouse Machine Co., Pittsburgh, Pa.

MARINE REPAIRS.
American Ship Building Co., Cleveland, O.
Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago Ship Building Co., So. Chicago, Ill.
Collingwood Ship Bldg. Co., Ltd., Collingwood, Ont., Can.
Milwaukee Dry Dock Co., Milwaukee, Wis.
St. Lawrence Marine Ry. Co., Ogdensburg, N. Y.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.
Toledo Ship Bldg. Co., Toledo, O.

MARINE STATIONARY FURNACE WALLS.
Wager, Robert H., New York, N. Y.

MARINE SUPERHEATERS.
Locomotive Superheater Co., New York, N. Y.

MARLINE.
Waterbury Co., New York, N. Y.

MARLINE COVERED WIRE ROPE.
Waterbury Co., New York, N. Y.

MATTRESSES AND PILLOWS.
(Ilanasilk.)
Robinson-Roders Co., The, Newark, N. J.

MECHANICAL WORKS.
Engberg's Elec. & Mech. Works, St. Joseph, Mich.

METALLIC PACKING.
U. S. Metallic Packing, The, Co., Philadelphia

METERS.
(Torsion.)
Cummings Ship Instrument Works, Boston.

MOORING LINES.
Durable Wire Rope Co., Boston, Mass.

MOTORS.
(Electric.)
Electro-Dynamic Co., Bayonne, N. J.
General Electric Co., Schenectady, N. Y.

MOTORS.
(Winch.)
General Electric Co., Schenectady, N. Y.

MUSIC WIRE.
Waterbury Co., New York, N. Y.

NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons, Brookline, Mass.

NAVIGATION COMPANIES.
Cleveland & Buffalo Transit Co., Cleveland, O.
Detroit & Cleveland Nav. Co., Detroit, Mich.
Hudson Navigation Co., New York, N. Y.
Northern Navigation Co., Sarnia, Ont., Can.

NOZZLES.
Morse, A. J., & Sons, Boston, Mass.

OAKUM.
Stratford, Geo., Oakum Co., Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

OIL.
(Linseed.)
Patterson-Sargent Co., Cleveland, O.

OIL BURNERS.
(Mechanical Atomizing.)
Moore & Scott Iron Wks., San Francisco, Cal.

OXYGEN AND HYDROGEN CYLINDERS AND CYLINDER STUD VALVES.
International Oxygen Co., New York City.

OXYGEN TESTING APPARATUS, WELDING AND CUTTING APPARATUS.
International Oxygen Co., New York City.

OXYGEN GENERATORS.
International Oxygen Co., New York City.

PACKING.
Carey, The, Co., Cleveland, O.
Home Rubber Co., Trenton, N. J.

PACKING.
(Metallic.)
U. S. Metallic Packing, The, Co., Philadelphia

PAINT.
(Copper and Iron.)
Patterson-Sargent Co., Cleveland, O.

PAINT.
(Graphite.)
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Patterson-Sargent Co., Cleveland, O.

PAINT.
(Hull.)
Patterson-Sargent Co., Cleveland, O.

PAINT.
(Marine.)
Patterson-Sargent Co., Cleveland, O.

PATENT IMPROVED BRIDGE WALLS.
Wager, Robert H., New York, N. Y.

PATENTS.
Siggers & Siggers, Washington, D. C.

PIG IRON.
Hanna, M. A., & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

PIPE.
(Welded Steel.)
Continental Iron Works, The, Borough of Brooklyn, N. Y.

PIPE BENDING MACHINES.
Cox, J. Fillmore, Engrg. & Tube Bending Machine Works, Bayonne, N. J.

PIPE WELDING.
Goldschmidt Thermit Co., New York, N. Y.

PITTSBURGH COAL.
Pittsburgh Coal Co., Pittsburgh, Pa.

PLUMBAGO.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

PNEUMERCATORS.
Pneumercator, The, Co., New York City.

POWER PLANTS.
General Electric Co., Schenectady, N. Y.

PROJECTORS.
(Electric.)
General Electric Co., Schenectady, N. Y.

PROPELLERS.
(Screw.)
American Screw Propeller Co., Philadelphia.

PROPELLER BLADES.
Sheriffs Mfg. Co., Milwaukee, Wis.

PROPELLER WHEELS.
American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Shipbuilding Co., Baltimore, Md.
Case, A. Wells, & Son, Highland Park, Conn.
Detroit Ship Building Co., Detroit, Mich.
Fore River Ship Building Corp., Quincy, Mass.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Roelker, H. B., New York City, N. Y.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Bldg. Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Co., Buffalo, N. Y.

PROVISIONS.
(Ship.)
Duluth Marine Supply Co., Duluth, Minn.
Erdman, Joseph, Detroit, Mich.
Schroeder Bros. Co., Two Rivers, Wis.

PUMPS.
Boston & Lockport Block Co., E. Boston, Mass.

PUMPS AND APPLIANCES.
(Air.)
Kingsford Fdy. & Mch. Co., Oswego, N. Y.

PUMPS.
(Bilge.)
Blackmer Rotary Pump Co., Petoskey, Mich.

PUMPS.
(Miscellaneous Use.)
Blackmer Rotary Pump Co., Petoskey, Mich.
Kingsford Fdy. & Mch. Co., Oswego, N. Y.
Roelker, H. B., New York City, N. Y.

PYROMETERS.
Locomotive Superheater Co., New York, N. Y.

REFRIGERATING MACHINERY.
Clother, The, Co., New York City, N. Y.
Roelker, H. B., New York City, N. Y.

REGISTERING INSTRUMENTS.
(Draft.)
Pneumercator, The, Co., New York City.

REGULATORS.
(Pressure.)
Ross Valve Mfg. Co., Troy, N. Y.

RELEASING DEVICE.
(Life Boat.)
Mulholland Hatch-Fastener Co., Cleveland, O.

REPAIRS.
(Boiler.)
Commercial Boiler Wks., The, Seattle, Wash.

REPAIRS.
(Marine.)
American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Ship Bldg. Co., Baltimore, Md.
Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago Ship Building Co., So. Chicago, Ill.
Collingwood Ship Bldg. Co., Ltd., Collingwood, Ont., Can.
Delaney, P., & Co., Newburgh, N. Y.
Detroit Ship Building Co., Detroit, Mich.
Fore River Ship Bldg. Corp., Quincy, Mass.
Goldschmidt Thermit Co., New York City.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Rocky River Dry Dock Co., Rocky River, O.
St. Lawrence Marine Ry. Co., Ogdensburg, N. Y.
Seattle Construction & Dry Dock Co., Seattle, Wash.
Superior Ship Bldg. Co., Superior, Wis.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.
Toledo Ship Bldg. Co., Toledo, O.

REVOLUTION COUNTERS.
Cummings Ship Instrument Works, Boston.

RIGGING.
Baltimore Dry Dock & Shipbuilding Co., Baltimore, Md.

RIVER STEAMERS.
Ward, The Chas., Engrg. Works., Charleston, W. Va.

ROPE.
Durable Wire Rope Co., Boston, Mass.

ROPE.
(Wire, Manilla and Fibreclad.)
Waterbury Co., New York City, N. Y.
Williams, Wm. E., New York, N. Y.

ROPE AND FITTINGS.
Durable Wire Rope Co., Boston, Mass.

ROPE DRESSING.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

ROPE DRIVES.
Waterbury Co., New York City, N. Y.

SEARCHLIGHTS.
General Electric Co., Schenectady, N. Y.

SCREW PROPELLERS.
American Screw Propeller Co., Philadelphia.

SCREW PROPELLERS.
(Manganese Bronze.)
American Manganese Bronze Co., Holmesburg, Pa.

SHEATHING FELT.
Stratford Oakum Co., Geo., Jersey City, N. J.

SHEAVES.
Boston & Lockport Block Co., East Boston, Mass.

SHEAVE LUBRICATING DEVICE.
Mulholland Hatch Fastener Co., Cleveland, O.

SHEET IRON WORKS.
Commercial Boiler Works, The, Seattle, Wash.

SHIP BUILDING SYSTEM.
Isherwood, J. W., London, E. C., England.

SHIP BUILDERS.
American Ship Bldg. Co., Cleveland, O.
Baltimore Dry Docks & Ship Bldg. Co., Baltimore, Md.
Bath Iron Works, Bath, Me.
Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago Ship Building Co., South Chicago, Ill.
Collingwood Ship Building Co., Ltd., Collingwood, Ont., Can.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Fore River Ship Bldg. Corp., Quincy, Mass.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moore & Scott Iron Works, San Francisco.
Seattle Const. & Dry Dock Co., Seattle, Wash.
Superior Ship Building Co., Superior, Wis.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.
Toledo Ship Building Co., Toledo, O.

SHIP CAULKERS.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.

SMOKE STACKS.
Lake Erie Boiler Works, Buffalo, N. Y.

SOO RIVER FUEL DOCK.
Pittsburgh Coal Co., Pittsburgh, Pa.

SPACING TABLE.
Standard Bridge Tool Co., Pittsburgh, Pa.

SPECIALTIES.
(Steam.)
Penberthy Injector Co., Detroit, Mich.
Ross Valve Mfg. Co., Troy, N. Y.

SPRINGS.
(Bed and Bunk.)
Southern-Rome Co., Baltimore, Md.

See Index to Advertisements for pages containing advertisements of companies listed above

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For Value, Service, Home Comfort

New **HOTEL TULLER**

Detroit, Michigan

Center of business on Grand Circus Park. Take Woodward car, get off at Adams Avenue

ABSOLUTELY FIREPROOF

200	Rooms,	Private	Bath,	$1.50	Single,	$2.50	Up	Double
200	"	"	"	2.00	"	3.00	"	"
100	"	"	"	2.50	"	4.00	"	"
100	"	"	"	3.00 to 5.00	"	4.50	"	"

Total 600 Outside Rooms

ALL ABSOLUTELY QUIET

Two Floors—Agents' Sample Rooms

New Unique Cafes and Cabaret Excellente

The McNab

"Known throughout the Maritime World."

The McNab Direction Indicators

(Gold Medal and Diploma Awards) indicate every movement and record the engine revolutions on the bridge. Thousands installed and specified for installation on 90% of steam vessels building in this country.

NO STEAMER COMPLETE WITHOUT IT.

The Willett-Bruce S. S. Whistle Control

The only control adopted by **all** Transatlantic and other Lines, large number of installations on order and installed in this country.

An automatic fog signal assured, and a **dry, clear, crisp, penetrating** blast guaranteed.

The McNab Pneumatic Engine Counter

Connect it up by a pipe and install it on your steam gauge board, do away with your constant clattering rods and small gear; it is a "revolution in counters."

The McNab "Cascade" Boiler Circulator and Fuel Economizer

Hundreds installed, a practical Circulator that **does circulate** and **economize.**

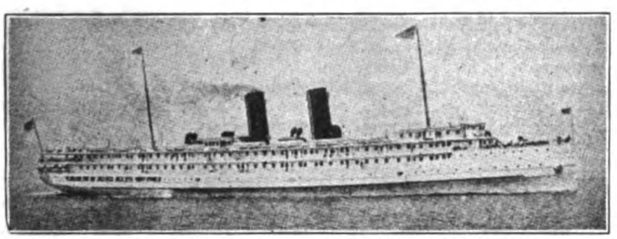
Write for a full set of our books.

THE McNAB COMPANY, Bridgeport, Conn.

or

EDW. P. FARLEY, 1501 Railway Exchange Bldg., Chicago, Ill.
D. E. FORD, 465 California St., San Francisco, Cal.
M. M. DRAKE, 17 Battery Place, N. Y. City.

PARSON'S MARINE TURBINES



TURBINE STEAMSHIPS YALE AND HARVARD

Marine Engines, Boilers and Machinery of All Kinds

Contractors for Vessels Complete

W. & A. FLETCHER COMPANY, Hoboken, N. J.

H. G. Trout Company

King Iron Works
BUFFALO, N. Y.

Manufacturers of High Grade PROPELLER WHEELS

Marine Engines
Brass and Iron Casting

Large variety of Grate Bars in stock

Write for particulars and testimonials.

CASE OUTWARD THRUST PROPELLER WHEELS

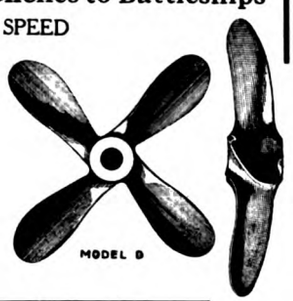
For Any Vessels, from Launches to Battleships

GREATEST POWER AND SPEED
LEAST VIBRATION

The most powerful and smoothest running Propeller on the market.
The maximum of efficiency.

Write for Catalog

A. WELLS CASE & SON
HIGHLAND PARK, CONN.



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STAYBOLTS.
(Boiler, Iron or Steel, Hollow or Solid.)
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Scully Steel & Iron Co., Chicago, Ill.

STEAM TURBINES.
DeLaval Steam Turbine Co., Trenton, N. J.

STEAMSHIP FUEL.
Pittsburgh Coal Co., Pittsburgh, Pa.

STEAMSHIP LINES.
(Passenger and Freight.)
American Line, New York City, N. Y.
International Merchantile Marine Co., New York City, N. Y.

STEERING GEARS.
American Engineering Co., Philadelphia, Pa.
American Ship Building Co., Cleveland, O.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.

STOCKS.
Armstrong Mfg. Co., Bridgeport, Conn.

STOKERS.
American Engineering Co., Philadelphia, Pa.
Babcock & Wilcox Co., New York, N. Y.

STOPPERS.
(Chain.)
American Engineering Co., Philadelphia, Pa.

SUBMARINE ARMOR.
Morse, A. J., & Son, Boston, Mass.
Schrader's, A., Son, Inc., Brooklyn, N. Y.

SUPERHEATERS.
(Locomotive.)
Locomotive Superheater Co., New York, N. Y.

SUPERHEATERS.
(Marine.)
Babcock & Wilcox Co., New York, N. Y.
Locomotive Superheater Co., New York, N. Y.

SUPPLY HOUSES.
Duluth Marine Supply Co., Duluth, Minn.
Erdman, Joseph, Detroit, Mich.
Schroeder Bros. Co., Two Rivers, Wis.
Williams, Wm. E., New York, N. Y.

SURVEYORS.
(Marine.)
Babcock & Penton, Cleveland, O.
Curr, Robert, Port Arthur, Ont., Can.
Furstenau, M. C., Philadelphia, Pa.

SWITCHBOARDS.
General Electric Co., Schenectady, N. Y.

TANKS.
Bath Iron Works, Bath, Me.

TANKS.
(Riveted.)
Lake Erie Boiler Works, Buffalo, N. Y.

TANKS.
(Steel.)
Fore River Ship Bldg. Corp., Quincy, Mass.

TANKS.
(Welded Steel.)
Continental Iron Works, The, Borough of Brooklyn, N. Y.

TELEGRAPH.
(Mechanical.)
Cory, Chas., & Son, New York City, N. Y.

TESTS OF MATERIALS.
Babcock & Penton, Cleveland, O.
Curr, Robert, Port Arthur, Ont., Can.
Furstenau, M. C., Philadelphia, Pa.

THERMIT.
Goldschmidt Thermit Co., New York City.

TORSION METERS.
Cummings Ship Instrument Works, Boston.

TOWING LINES.
(Manila, Wire.)
Waterbury Co., New York, N. Y.

TOWING MACHINES.
American Engrg. Co., Philadelphia, Pa.
Chase Machine Co., Cleveland, O.

TRAMWAYS.
(Wire Rope.)
Waterbury Co., New York, N. Y.

TRANSMISSION.
(Rope.)
Waterbury Co., New York, N. Y.

TUGS.
Bath Iron Works, Bath, Me.

TURBINES.
Bath Iron Works, Bath, Me.
DeLaval Steam Turbine Co., Trenton, N. J.
Fletcher, W. A., & Co., Hoboken, N. J.
Fore River Ship Bldg. Corp., Quincy, Mass.

VALVES.
Ashton Valve Co., Boston, Mass.
Penberthy Injector Co., Detroit, Mich.
Ross Valve Mfg. Co., Troy, N. Y.
Williams, Wm. E., New York, N. Y.

VALVES.
(Blow-Off.)
Scully Steel & Iron Co., Chicago, Ill.

VALVES.
(For Water and Gas.)
Ashton Valve Co., Boston, Mass.
Williams, Wm. E., New York, N. Y.

VESSEL AGENTS.
Vance & Joys Co., Milwaukee, Wis.

VESSEL BROKERS.
Farley, Edward P., Co., Chicago, Ill.
Richardson, W. C., & Co., Cleveland, O.

WELDING.
(Flue.)
Case, A. Wells, & Son, Highland Park, Conn.

WELDING PROCESSES.
Goldschmidt Thermit Co., New York City.

WHISTLE VALVES.
(Electrically Controlled.)
Electric Control Co., New York City.

WINCHES.
American Engineering Co., Philadelphia, Pa.
Chase Machine Co., Cleveland, O.

WINDLASSES.
American Engrg. Co., Philadelphia, Pa.
American Ship Building Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.

WIRE.
Waterbury Co., New York, N. Y.

WIRE AND WIRING DEVICES.
General Electric Co., Schenectady, N. Y.

WIRE ROPE.
Durable Wire Rope Co., Boston, Mass.
Waterbury Co., New York, N. Y.

WIRE ROPE DRESSING.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

WOODEN SHIP REPAIRS.
Tietjen and Lang Dry Dock Co., Hoboken, N. J.

YACHT BUILDERS.
Bath Iron Works, Bath, Me.
Rocky River Dry Dock Co., Rocky River, O.

YACHT PLUMBAGO.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

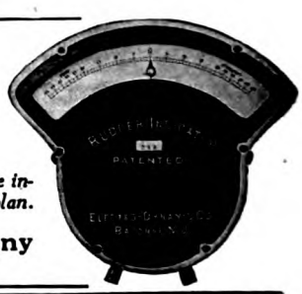
YARN.
(Lath, Fodder.)
Waterbury Co., New York, N. Y. Manitowoc, Wis.

YAWLS.
Drein, Thos., & Son, Wilmington, Del.
Manitowoc Ship Building Co., Manitowoc, Wis.

YOUGHIOGHENY COAL.
Pittsburgh Coal Co., Pittsburgh, Pa.

THE CHASE MACHINE CO.
ENGINEERS AND MACHINISTS
Mooring Machines, Deck Winches, Steam Capstans, Etc., Etc.
Address 2313 Elm St. N. W. **Cleveland, Ohio**

The Electric Rudder or Helm Angle Indicator
Placed in pilot house or on bridge in front of quartermaster, allows him to observe the position of the rudder the same as he does the compass. *Can be installed on vessels with or without lighting plan.*
Electro-Dynamic Company
Bayonne, New Jersey, U. S. A.



Fore River Ship Building Corporation
QUINCY, MASS.
SHIPBUILDERS and ENGINEERS
Brass Founders Machinists Galvanizers
Curtis Marine Turbines Yarrow Watertube Boilers

PATENTS
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Thirty years' active practice. Experienced, personal, conscientious service. All business strictly confidential.
SIGGERS & SIGGERS
PATENT LAWYERS
Suite 11, National Union Ins. Bldg., Washington, D. C.

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DETROIT, MICH.
JOSEPH ERDMAN, 932-936 Congress St. East, Detroit, Mich. Fine groceries and meats. Imported wines and liquors. Paints, oils, leads, etc. Prompt deliveries. Phones: East 110, East 3028.

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THE DULUTH MARINE SUPPLY CO. Largest on the Great Lakes. Meats, groceries, ship chandlery, cabin supplies, oils, ice and milk. Delivered directly and promptly by our three tugs aboard ship. Foot of Fifth Ave. West. 780 both phones.

TWO RIVERS, WIS.
SCHROEDER BROS. CO., Two Rivers, Wis. Dealers in general mdse., staple and fancy groceries, fruits and vegetables. Marine trade solicited and promptly served.

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THE COAST LINE TO
MACKINAC

DETROIT, CLEVELAND BUFFALO, NIAGARA FALLS.

TOLEDO, PT. HURON, ALPENA, ST. IGNACE.

A REAL VACATION

The D. & C. Line Steamers embody all the qualities of speed, safety and comfort. The freedom of the decks, cool, refreshing lake breezes and commodious state rooms makes life aboard these floating palaces a source of enjoyment.

"D. & C. A SERVICE GUARANTEE"

Daily service between Detroit and Buffalo and Detroit and Cleveland. Day trips during July and August, as well as two boats out of Detroit and Cleveland every Saturday and Sunday nights during these two months. FOUR TRIPS WEEKLY FROM TOLEDO AND DETROIT TO MACKINAC ISLAND AND WAY PORTS—From June 25th to Sept. 10th, SPECIAL STEAMER CLEVELAND TO MACKINAC ISLAND. TWO TRIPS WEEKLY. NO STOPS ENROUTE EXCEPT AT DETROIT EVERY TRIP. Daily service between Toledo and Put-in-Bay, June 10th to Sept. 10th.

RAILROAD TICKETS ACCEPTED on D. & C. Line steamers between Detroit, Cleveland and Buffalo, either direction. Send two cent stamp for illustrated pamphlet and Great Lakes Map. Address L. G. Lewis, G. P. A., Detroit.

DETROIT & CLEVELAND NAVIGATION COMPANY
P. H. McMILLAN, Pres. A. A. SCHANTZ, V. P. & G. M.

Take a Cruise
on the GREAT LAKES

Get away from the monotony of the office, factory or farm.

Take a Real Vacation—full of pleasant surprises—of unique features—of wondrous sights.

Make your business trip a pleasure voyage. The big fleet of Northern Navigation Liners are making tri-weekly trips on the lake Huron-Superior Cruise, making possible fast, comfortable, safe travel.

Between Detroit, Mich., Sarnia, Ont., Sault Ste. Marie, Ont., Port Arthur, Ont., Fort William, Ont. and Duluth, Minn.

Features of These Cruises

Included in the Tickets are the Finest Meals and Most Comfortable Berths. Special Train Visits to Kakabeka Falls—Basket Picnic—Special Shore Dinner at Big Hotel, Boulevard Drive in Terminal City—Inspection of Largest Locks on Fresh Water—Afternoon Tea on Shipboard—Dancing in Big Ballroom Every Evening—Music by Ship's Orchestra—Refreshments After Dancing, etc., etc.

Complete Cruise $40
Everything Included (6 day trip)

Also Georgian Bay one way 4 day trips—Between Collingwood and Sault Ste. Marie—and 30,000 Island one way trip between Parry Sound and Penetang.

Good connections with through lines east and west at Detroit, Mich., Sarnia, Ont., and Fort William.

Write for folders and information—Ask any ticket agent.
Make your reservations NOW in advance.

NORTHERN NAVIGATION CO., Ltd., Sarnia, Ontario.

AMERICAN LINE

The Only Trans-Atlantic Steamers Under the American Flag

FAST EXPRESS SERVICE

NEW YORK
LIVERPOOL

Sailing from New York
Every Saturday
at 12 noon

"St. Louis"

"St. Paul"

"New York"

"Philadelphia"

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Pier 62, North River, Foot of West 23rd St., New York

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India Bldg., 84 State St., Boston
1306 F St., N. W., Washington
219 St. Charles St., New Orleans
14 N. Dearborn St., Chicago
Northwest Corner 11th and Locust Sts., St. Louis
121 South Third St., Minneapolis
319 Geary St., San Francisco
619 Second Ave., Seattle
41 King St. East, Toronto
118 Notre Dame St., Montreal

FARE $3.00 DAILY BETWEEN CLEVELAND & BUFFALO

The Great Ship "SEEANDBEE"

The largest and most costly steamer on any inland water of the world. Sleeping accommodations for 1500 passengers.

"CITY OF ERIE" "CITY OF BUFFALO"

3 Magnificent Steamers

DAILY BETWEEN—
CLEVELAND AND BUFFALO
MAY 1st TO NOV. 15th.

Leaves Cleveland - 8:00 P. M. Leaves Buffalo - 8:00 P. M.
Arrive Buffalo - 6:30 A. M. Arrive Cleveland - 6:30 A. M.
(Central Standard Time)

Connections at Buffalo for Niagara Falls and all Eastern and Canadian points. Railroad tickets reading between Cleveland and Buffalo are good for transportation on our steamers. Ask your ticket agent for tickets via C. & B. Line.

Beautifully colored sectional puzzle chart, showing both exterior and interior of The Great Ship "SEEANDBEE" sent on receipt of five cents to cover postage and mailing. Also ask for our 24-page pictorial and descriptive booklet free.

THE CLEVELAND & BUFFALO TRANSIT CO.
Cleveland, Ohio

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For Instance:

If Hugh Chalmers' faith in advertising could be wafted throughout the field of industry, prosperity would be at the door of *every* manufacturer. Industry would never be stinted by pessimistic demands. Hugh Chalmers has invested hundreds of thousands of dollars in advertising and has drawn a manifold reward in return. But Chalmers is just one of them. There are scores in his class, all reaping their harvests.

In a recent address before a group of business men, he said:

"The two chief elements in successful business are advertising and salesmanship. Oral salesmanship is like individual teaching, while newspaper advertising, which is another form of salesmanship, is like a public school. You reach one person by one method, thousands or even millions, by the other method."

"There are only two excuses why a man should not advertise. One is because he has too much business, and don't have to, and the other is because he has too little business and can't afford to."

"Successful advertising is summed up in having the right idea, and using it at the right time."

"Advertising should be honest, sensible, and persistent.

"Advertising must be persistent because the hardest thing to find is yesterday's newspaper. If you don't believe it, try it."

*"There may be some men who believe that because they have been in business in * * * * all their lives that they do not need to advertise. They are like the fellow wearing blue goggles who winked at a girl. He knew he was winking, but she didn't. Just so, if a man does not advertise he may know he is in business, but the public is likely to be unaware of it."*

The above applies to the Marine industry and to all other divisions of industry. Advertising is a necessary integral part of every successful sales organization. It is a business-builder. It endows the business organization with a personality and gives to it prestige that neither flood nor fire can sweep away. The MARINE REVIEW, therefore is the logical vehicle to carry your advertising to the marine trade.

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Wanted and For Sale

RATES

All classified ads.—four cents (4c) per word. No. ad. accepted for less than $1.00.

Remittance should accompany order for one-time ads.

IMPORTANT

Seven (7) words must be allowed for box address.

To insure insertion, copy should reach us before the 9th of the month.

Help Wanted

WANTED:—ACTIVE MAN WITH SOME experience in wooden shipbuilding, to take charge of office correspondence and similar work, with a going concern. Address Box 130, THE MARINE REVIEW, Cleveland, O.

Position Wanted

FOREMAN PAINTER. KNOWS HIS work, wants position with ship building plant, on coast or otherwise where duty and good service will be recognized; at present with Great Lakes firm; 20 years ship yard experience. Address Box 133, THE MARINE REVIEW, Cleveland, O.

Wanted

WANTED:—A SAND SUCKER ABOUT 250 yds. capacity; self-propelled. Give full particulars, price and where located. Address Box 131 THE MARINE REVIEW, Cleveland, O.

WANTED: — SAILING VESSEL FOR Lumber trade on Lakes or Mississippi river; also freight steamer, immediate or close navigation. Submit particulars, price. John A. Moody. London, Ont., Can.

WANTED: — STEAM TUG ABOUT 50 GROSS TONS; DRAFT 10 FEET; POWER WANTED EQUAL TO 20-INCH x 20-INCH ENGINE WITH 150 POUNDS STEAM. ADDRESS P. O. BOX 202, MASSENA, N. Y.

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WANTED: — ACTIVE CONCERN TO take agency in Great Lakes district for a good line of metallic packing. Address Box 132, THE MARINE REVIEW, Cleveland, O.

For Sale

FOR SALE.
LAKE AND OCEAN VESSELS,
Dredges, Scows, Tugs
And Lighters
Clarence L. Parker, Vessel Agent
Foot of First St., Detroit, Mich.

FOR SALE:—LOCOMOTIVE CRANES, McMyler revolving derricks, with clam shells. The Cleveland & Erie Machinery Co., Rockefeller Bldg., Cleveland, O.

FOR SALE:—STEAMER MOHEGAN IN thorough condition throughout; rates 95 high power; two new Scotch boilers 11 ft. 6 in. x 14 ft. 6 in.; steel boiler house; recently in dry dock; will run 12 miles an hour light or loaded; capacity 1,200 M. ft. lumber; 1,600-1,700 tons coal. Address Graves, Bigwood & Co., Buffalo, N. Y.

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PLANT FOR SALE:—ONE 3-CU. YD. dipper dredge; 1 Tug boat, 13 x 15 cylinder, hull 40 feet x 13 feet x 6 feet; 3 derrick scows; 1 flat scow 76 feet x 24 feet x 7 feet 6 inches; two 300-cubic yard mud scows; one 1½-yard orange peel bucket; one 1¼-yard Williams clam shell bucket; one direct connected ¾-cubic yard concrete mixer; one marine lake type boiler 16 feet long, 9 feet in diameter, but for 145 pounds working pressure heating surface 2,400 square feet. Great Lakes Construction Co., 1020 Leader-News building, Cleveland, O.

FOR SALE:—STEAM SAND SUCKER, fully equipped; capacity 180 yards, length 117 feet, beam 23 feet; draft; light 7 feet, loaded 10 feet; at a bargain price if taken at once. Address Box 94, THE MARINE REVIEW, Cleveland, O.

FOR SALE:—WHEELER SURFACE CON-denser 2,100 S. F. with combination pump. Geo. J. Adams, 39 South street, New York, N. Y.

FOR SALE:—AT A BARGAIN THE choice Milwaukee built freight steamer Thomas Davidsen about 300 ft. long, 42 ft. beam, 21 ft. depth of hold. Carries about 112-115 thousand bushels wheat, about 125-130 thousand bushels barley, 165 thousand oats. Owner retiring, has sold out all but this steamer. Inquire of H. J. Pauly, 165-18 St., Milwaukee, Wis.

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We will pay $80.00 to $120.00 per ton for vessels or take long charter. Wire details our expense. Reliable Brokerage Co., 11 Broadway, New York City, N. Y.

FOR SALE:—TUG RUNNELS, 58.9 x 15.3 ft. depth 6.9, draws 8 ft. of water. Gross tonnage 37.87, net 18. 16 sq. high pressure engine. Boiler about 120 lb. Dorr E. Warner, Atty., Cleveland, O.

FOR SALE:—TWO SCOTCH MARINE Boilers, 13 ft. 6 in. diameter, 12 ft. long; allowed 130 lb. steam, good condition; cheap for cash. Inquire Pringle Barge Line Co., 327 Rockefeller Bldg., Cleveland, O.

FOR SALE

Life Rafts—Life Boats—Life Preservers — various sizes. Miscellaneous marine equipment almost as good as new. Let us know your needs. Roosevelt Steamship Co., 350 North Clark street, Chicago, Ill.

FOR SALE STEAMER LIBERTY, FIRST-class condition; keel 97 ft., beam 18 ft. 6 in., classes at 90, well equipped, 200 passenger capacity, engine 16 x 22, boiler 120 lbs. Address J. M. Clow, Marinette, Wis.

STEAMER FOR SALE:—THE "C. F. Bielman"; 291 feet keel, 41 feet beam; coal capacity 3,400 tons; wheat 110,000 bushels. A bargain at price offered for. Angus G. Mackay, 601-2 Meisel building, Port Huron, Mich.

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ARTHUR LANGELL,
Ship Building and Repair Yard
Electrically equipped. Best of service and rate guaranteed. Steel parts reinforced and shaped. Machine shop conveniences.
ST. CLAIR, MICH.

FOR SALE: — STEAM BARGE OR lighter—100 tons dead weight; 60,000 lumber, equipped with steam hoist; spar and boom 3 tons capacity. 30 ft. beam-draft loaded 6 ft. 6 in. Boiler built 1907—100 horsepower steam engine; boiler and whole boat in good condition.

FOR SALE:—Three scows 4 ft. 6 in. x 20 ft. x 60 ft. One equipped with derrick, cables and hoist of 8 tons capacity.

FOR SALE:—Harbor tug 44 feet long, engine 8 x 10 inches; large boiler. Hull and fitout in good condition.

FOR SALE:—Tug hull 6 feet deep, 15 feet beam, 60 feet long over all. With cabin for use as house boat. Can cheaply be made steam or gas tug. Hull in very fair condition.

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FOR SALE:—Steam passenger boat; 50 feet long, 12 foot beam, 50-H. P. Daring water tube boiler. 40-H. P. 3-cylinder steam engine. Full cabin with toilet allowed 59 passengers. All first-class condition.

Have cash customers for good sailing vessels. Steam or tow barges. Write or wire me what you have for sale, or what you want to buy. There is always something doing. John W. Averill, 1434 W. 6th street, Cleveland, O.

FOR SALE: — PASSENGER STEAMER length 152 ft., beam 25 ft., staterooms 34, berths 102, engine fore and aft compound 16 x 36 ft., boiler 15 ft. x 102 in., steam allowed 140 lbs. Boat located on Great Lakes. For price and full particulars, address Box 129, THE MARINE REVIEW, Cleveland, O.

BARGE FOR SALE:—80 FT. OVER all, 24 ft. 6 in. beam; 6 ft. 7 in. depth. Steel sheet trusses. Air chambers. Bargain. Pittsburg Coal Co., Ft. of North Water street, Chicago, Ill.

FOR SALE:—BOILER AND ENGINE, also auxiliary boiler and deck engine of steamer Otego at Johnson's Ship Yard, Green Bay, Wis. Apply James A. Myers & Co., 639 Postal Telegraph Bldg., Chicago, Ill.

FOR SALE.

Three Boilers, which have been used very little in about eight months, dimensions as follows: 66-in. diameter, by 18 ft. long, fitted with 70—3½-in. by 18 ft. charcoal tubes, thickness of shell 7/16 in., thickness of head ¾ in. gages of tubes No. 10; tripple riveted butt straps on longitudinal seams; horsepower from 125 to 140 each "Normal"; allowed government pressure 150 lbs. to sq. in. (Dimensions of one Boiler same as above, except 2 ft. shorter.) For particulars write, TOWLES STEAMSHIP LINE, W. H. Towles, Owner, Fort Meyers, Fla.

FOR SALE:—A FEW REBUILT CAMP-bell marine motors for sale cheap and special discounts on all 1915 models from 5 to 60 H. P. Campbell Motor Mfg. Co., Minneapolis, Minn.

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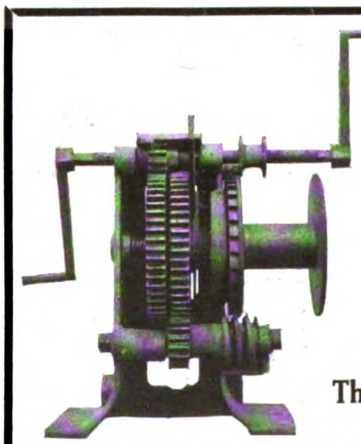

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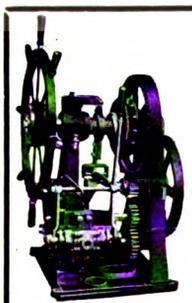

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OF ALL KINDS

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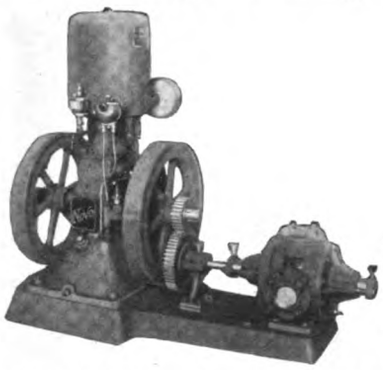
Can You Beat This With Your Bilge Pump?



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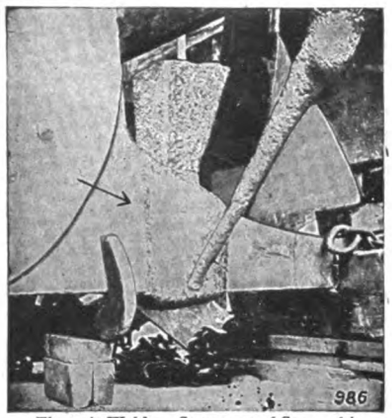
Priming not necessary.

BLACKMER ROTARY PUMP COMPANY
PETOSKEY, MICH.



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WILLIAM C. CUNTZ, Gen. Mgr.
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103 Richmond St., W., Toronto, Ont.

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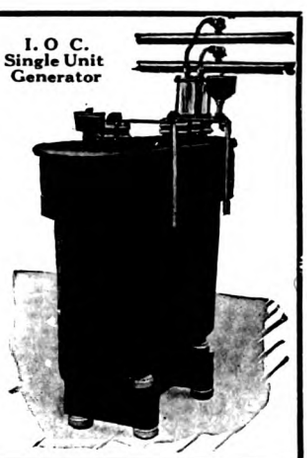

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STAYBOLT BARS
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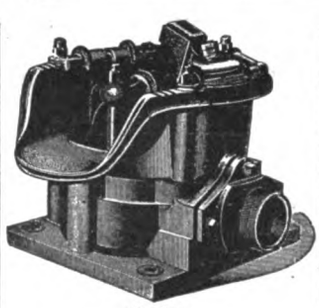
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STAR BRAND BLOCKS
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STRONGEST BLOCKS MADE

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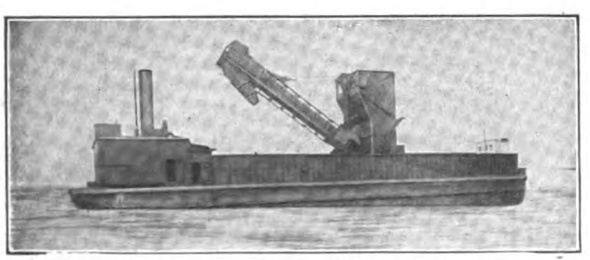
PICKANDS, MATHER & CO.



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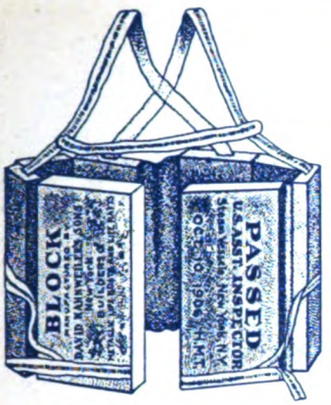

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RING BUOYS AND FENDERS

Approved and adopted by U. S. Board of Supervising Inspectors. Also adopted by the principal Ocean, Lake and River Steamer Lines as the only Reliable Life Preserver. Awarded four Medals by World's Columbian Exposition.

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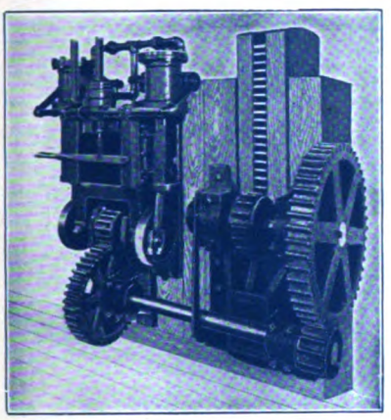

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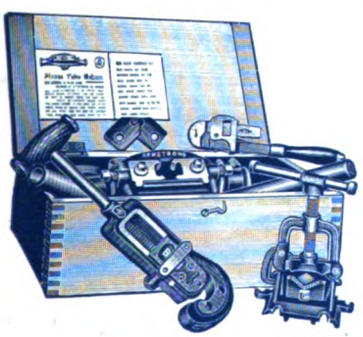

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1 No. 2 Genuine Armstrong Stock	¼	in. to	1 in. R
1 " 1 Model B Pipe Cutter	⅛	"	1¼
1 Junior Hinged Pipe Vise	⅛	"	1¼
1 10 in. Stillson Wrench	⅛	"	1

STOCKS ARE FITTED WITH BARD ADJUSTABLE BUSHING IN A HARD WOOD CASE
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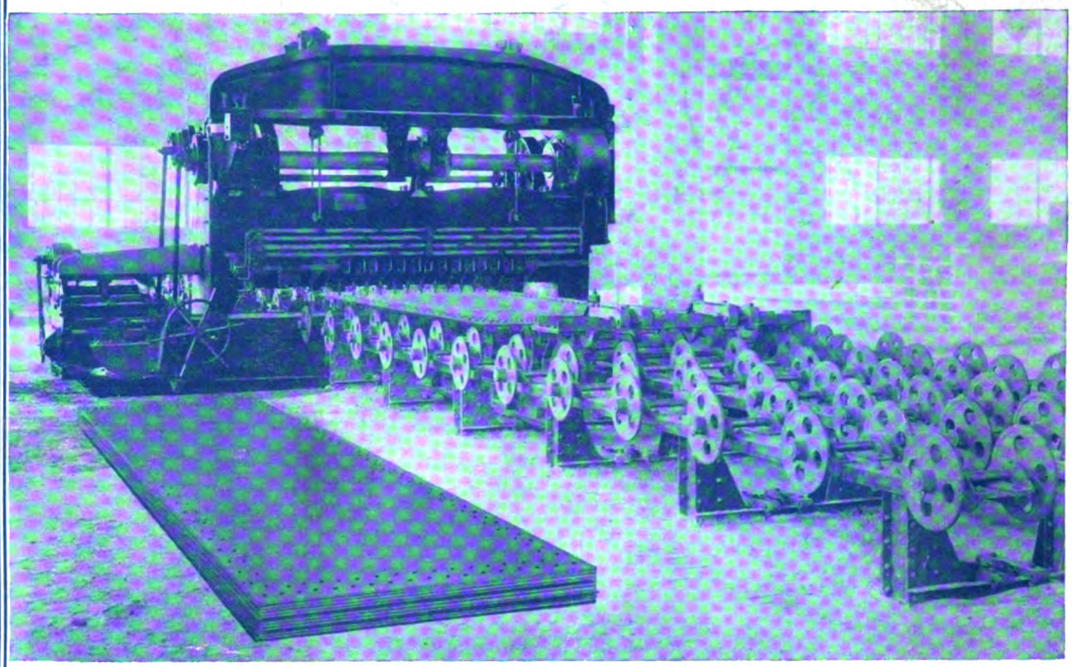

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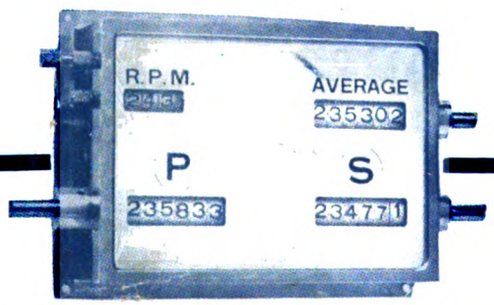

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THE MARINE REVIEW

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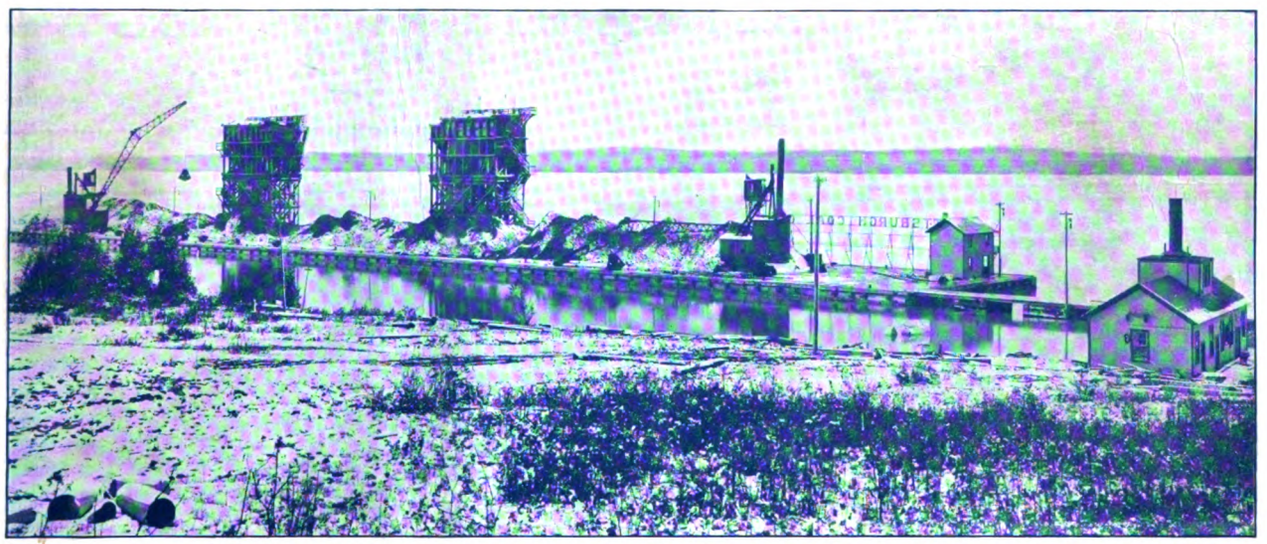
PITTSBURGH COAL COMPANY
LIME ISLAND FUEL DOCK



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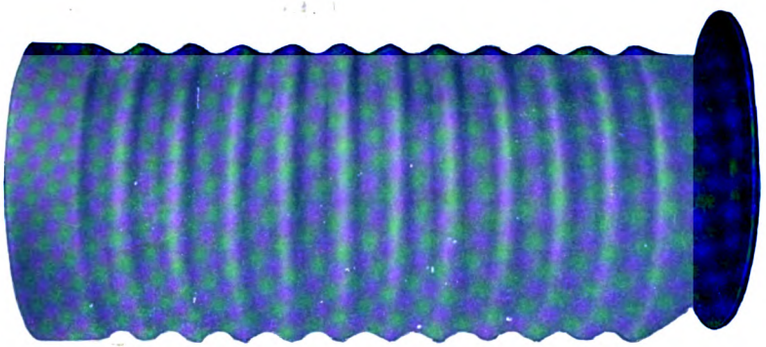

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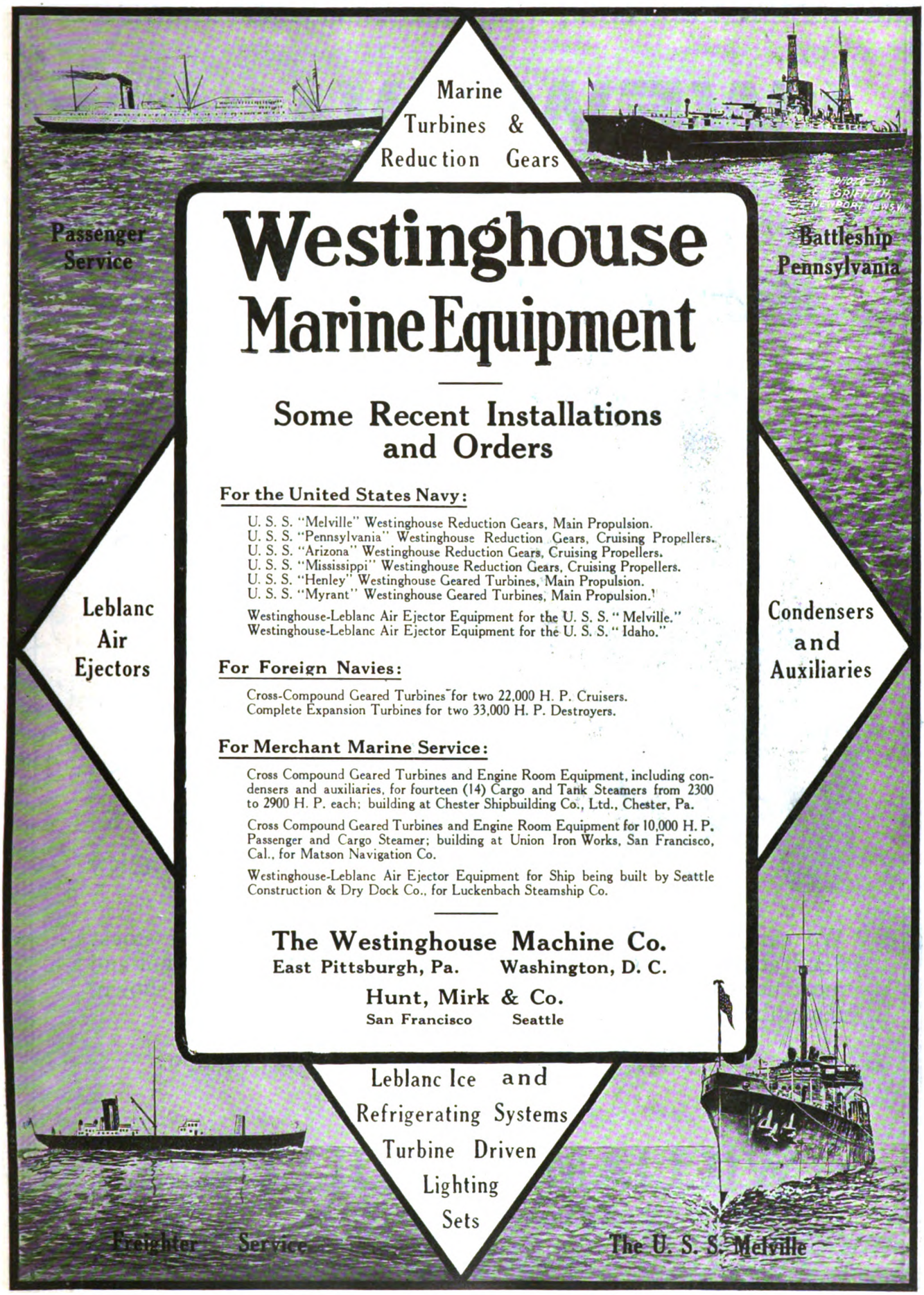

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